POTOMAC RIVER BASIN
INDIAN CREEK
PRINCE GEORGES COUNTY

MARYLAND

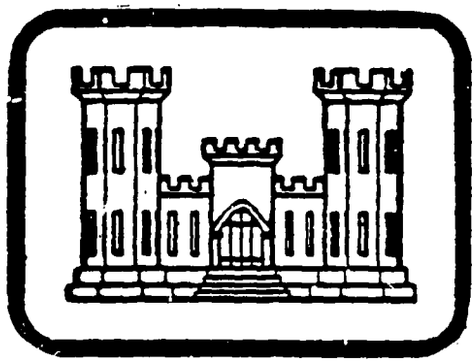
NDI I.D. No. MD 81

LEVEL II

CONTEE MAIN SETTLING POND DAM

CONTEE SAND AND GRAVEL COMPANY

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



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PREPARED FOR

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
BALTIMORE, MARYLAND 21203

BY

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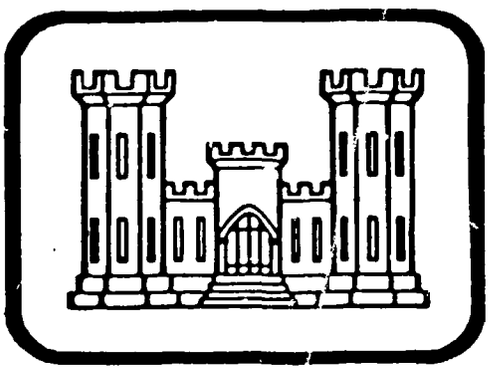
JULY 1981

POTOMAC RIVER BASIN

CONTEE MAIN SETTLING POND DAM
PRINCE GEORGES COUNTY, MARYLAND
NDI I.D. No. MD 81

CONTEE SAND AND GRAVEL COMPANY

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I investigations. Copies of these guidelines may be obtained fom the Department of the Army, Office of Chief of Engineers, Washington, DC 20314.

The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon visual observations and review of available data. Detailed investigations and analyses involving topographic mapping, subsurface investigations, materials testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify the need for such studies which should be performed by the owner.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detected if inspected under the normal operating environment of the structure.

It is important to note that the condition of the dam depends on numerous and constantly changing internal and external factors which are evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some time in the future. Only through frequent inspections can some unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I investigations are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" (PMF) for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

SYNOPSIS OF ASSESSMENT AND RECOMMENDATIONS

NAME OF DAM:	Contee Main Settling Pond Dam
STATE LOCATION:	Maryland
COUNTY LOCATION:	Prince Georges
STREAM:	Indian Creek
DATE OF INSPECTION:	May 5, 1981
COORDINATES:	Lat. 39° 4.2'
	Long. 76° 54.6'

ASSESSMENT

Based upon the field reconnaissance and review of available information and performance history, Contee Main Settling Pond Dam is probably structurally stable but in poor condition at the present time.

The seep located at the downstream toe of the embankment and the suspected seepage at the left abutment entering the pipe culvert are not considered to represent a serious hazard at this time. However, there is concern that seepage flow in these areas may cause a piping condition to develop. Piping in either area could cause the embankment to be unstable.

The "small" size, "high" hazard classification of the dam dictates a spillway design flood of 50 percent to 100 percent PMF. The 50 percent PMF was selected as the spillway design flood because of the relatively small maximum storage volume of 62 acre-feet and shallow reservoir depth.

The dam can only pass 10 percent of PMF runoff without overtopping. Runoff from the 50 percent PMF would overtop the embankment by a maximum depth of 1.2 feet for a duration of 8.7 hours. A maximum stage level of 0.7 feet above the embankment crest was considered sufficient to initiate a dam breach. Based on this breach criteria, it was found that the dam breach would occur with 40 percent PMF runoff and that the breach would cause an increase in flood level of 1.5 feet at the damage center. This flood level increase is not considered sufficient to increase the inundation of residential structures or Route 95. The spillway system is therefore considered inadequate, but not seriously inadequate, according to guideline criteria.

Another deficiency in need of attention is the erosion control provisions at the principal spillway outlet. During full spillway discharge, the pieces of sheet metal that the spillway discharges onto would probably be dislocated. Discharge onto the downstream embankment slope would cause erosion and possible embankment failure.

Other deficiencies that were encountered are related to maintenance and operation procedures at the dam facility. Recommendations for addressing these conditions and procedures are outlined below.

RECOMMENDATIONS

1. Implement additional studies by a professional engineer to evaluate the extent of improvements required to provide sufficient discharge capacity or erosion/breaching protection for the dam. A plan to provide adequate erosion protection of the embankment at the principal spillway outlet should also be devised. Improvements found necessary by the recommended study should be implemented immediately.

2. Monitor the seep located at the downstream embankment toe (See Field Sketch). If increased flow quantity or evidence of erosion is observed, the Maryland Water Resources Administration , Dam Safety Division should be notified immediately, and necessary corrective repairs made.

3. The inside of the pipe culvert at the left abutment should be inspected for evidence of seepage transporting soil fines into the culvert (piping). If evidence of piping is observed, the Maryland Water Resources Administration, Dam Safety Division, should be notified immediately, and necessary corrective repairs made.

4. Develop and implement measures to prevent erosion of barren areas in the emergency spillway channel.

5. Remove the trees growing from the embankment and repair the steel screen trash rack of the principal spillway riser. Also, clear fallen trees and other debris from the emergency spillway channel.

6. Develop a formal flood surveillance and warning plan to advise downstream residents when high flows are expected. The plan should also include an evacuation procedure.

7. Implement a more thorough maintenance program to regularly remove future tree growth from the embankment and debris obstructing the principal and emergency spillways.

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Maryland Registration No. 5284
Vice-President
7/16/81
Date

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Project Engineer
7/16/81
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APPROVED BY:

James W. Peck
Colonel, Corps of Engineers
Commander and District Engineer
24 Aug 81
Date

CONTEE MAIN SETTLING POND DAM

OVERVIEW OF DAM

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
CONTEE MAIN SETTLING POND DAM
NATIONAL I.D. NO. MD 00081

SECTION 1
PROJECT INFORMATION

1.1 GENERAL

A. AUTHORITY: This Phase I investigation was performed pursuant to authority granted by Public Law 92-367 (National Dam Inspection Act) to the Secretary of the Army, through the Corps of Engineers, to conduct inspections of dams throughout the United States.

B. PURPOSE: The purpose of this investigation is to make a determination on whether or not the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

A. DAM AND APPURTENANCES

1. Embankment: The embankment is approximately 700 feet long, constructed of compacted soil, and has a toe to crest height of 34.3 feet with respect to the lowest point on the embankment crest. The embankment crest is about 44 feet wide and varies in elevation from 2.3 feet to 7.9 feet above normal pool level. The upstream and downstream slopes of the embankment have inclinations of 1.5H:1V and 2.75H:1V, respectively. The upstream reservoir area is used as a sand and gravel quarry and it is reported that the embankment was constructed from these materials. At the left abutment, a 200 foot long row of sheet piling was installed in order to reduce the amount of seepage emanating towards Route 95.

2. Outlet Works: The dam does not have a reservoir drain. A diesel operated pump is sometimes used to cycle clarified water for reuse in quarry operations.

3. Spillways:

   a. Principal Spillway: The principal spillway is located near the right abutment and consists of a concrete inlet riser and corrugated metal outlet pipe. Two weir crest openings on the sides of the concrete riser maintain normal pool level at El. 234. The top of the riser is covered with a steel trash screen.

   b. Emergency Spillway: The emergency spillway consists of a trapezoidal channel excavated into the right abutment. The channel is 40 feet wide and has a crest elevation of 234.3 feet. The emergency spillway channel has 2 feet of freeboard.

4. Downstream Conditions: The Contee Main Settling Pond Dam is located across Indian Creek, which is a tributary of the Anacostia River. Interstate Route 95 crosses Indian Creek approximately

2000 feet downstream from the dam. Between the dam and Route 95, there are four homes adjacent to and within a 10 foot elevation difference of Indian Creek. Two reinforced concrete box culverts convey Indian Creek under Route 95. Indian Creek flows through the town of Beltsville about 2 miles downstream from the dam.

B. LOCATION: The dam is located two miles north of the town of Beltsville in Prince Georges County, Maryland.

C. SIZE CLASSIFICATION: The Contee Main Settling Pond Dam has maximum storage volume (El. 236.3) of 62.1 acre-feet and a toe to crest height of 34.3 feet. The dam is classified as an "small" size structure according to Corps of Engineers guidelines.

D. HAZARD CLASSIFICATION: The Contee Main Settling Pond Dam is classified as a "high" hazard dam. If a dam failure would occur, Route 95 and four homes located adjacent to Indian Creek would be affected. Major damage and loss of more than a few lives to residents and motorists are considered possible.

E. OWNERSHIP: The dam is owned by the Contee Sand and Gravel Company, Inc. All correspondence concerning the maintenance and operation of the dam should be directed to:

Contee Sand and Gravel Co., Inc.
P.O. Box 1000
Laurel, Maryland 20810
Attn: Mr. James Payne
Phone: (301) 953-2600

F. PURPOSE OF DAM: The purpose of the dam is to provide a settling pond for sand and gravel quarry operations.

G. DESIGN AND CONSTRUCTION HISTORY: The dam was reportedly designed and constructed by the Contee Sand and Gravel Company in 1957. No other information is known about the design and construction history of the dam.

H. NORMAL OPERATING PROCEDURE: The Contee Main Settling Pond Dam was designed to operate as an uncontrolled structure. Normal pool level is maintained at El. 234 by the weir crest openings of the principal spillway riser. The dam does not have a reservoir drain and does not require a dam tender.

1.3 PERTINENT DATA

Note: The elevations given below are based on normal pool level being at El. 234 M.S.L. as shown on the USGS quadrangle map (see location plan).

A. Drainage Area	1.08 sq. mi.
B. Discharge at Dam Facility	
Maximum flood at dam facility	Unknown
Spillway capacity at lowest point of dam crest (El. 236.3)	350 cfs.

C. Elevation

Design top of dam	Unknown
Existing top of dam (minimum)	236.3
Principal spillway weir crest	234.0
Emergency spillway crest	234.3
Normal pool	234.0
Maximum tailwater	Unknown
Streambed at downstream toe	202

D. Reservoir Length

Length of maximum pool	1250 feet
Length of normal pool	400 feet

E. Reservoir Storage

Existing top of dam (El. 236.3)	62.1 acre-feet
Emergency spillway crest (El. 234.3)	12.6 acre-feet
Normal pool (El. 234.0)	5.2 acre-feet
Sediment Pool	Unknown

F. Reservoir Surface

Existing top of dam (El. 236.3)	22.6 acres
Emergency spillway crest (El. 234.3)	16.4 acres
Normal pool (El. 234.0)	5.2 acres*
Sediment Pool	15.5 acres*

*The surface area at the El. 234.0 contour is 15.5 acres. Approximately 1/3 of this area is water (5.2 acres). The remaining 2/3 is sediment.

G. Embankment

Type	Earthfill
Length	700 feet
Height (Minimum)	34.3 feet
Crest width	44 feet
Slopes	
Downstream	2.75H:1V
Upstream	1.5H:1V
Impervious core	Unknown
Cutoff Provisions	Unknown

H. Principal Spillway

Type	Concrete riser with a 6 ft. dia. corrugated metal outlet pipe.
Riser height	7 feet approx.
Length of connecting outlet pipe	100 feet approx.
Gates	None

I. Emergency Spillway

Type	Trapezoidal earth channel
Width	40 feet
Length	550 feet
Approach channel slope	Unknown
Discharge channel slope	2%
Gate	None

SECTION 2
ENGINEERING DATA

2.1 DESIGN

A. DATA AVAILABLE: The following information was provided by the Dam Safety Divison, Maryland Water Resources Administration:

1. Drawing showing sediment control plan for Contee property prepared by Greenhorne and O'Mara, Inc., and dated July 1974.

2. Photocopy showing plan view of Contee Main Settling Pond.

3. Water Resource Administration information summary for Contee Main Settling Pond.

B. DESIGN FEATURES:

1. Field Investigation: There are no records indicating that a field investigation was undertaken prior to the construction of the dam.

2. Embankment: Most of what is known about the design features of the embankment was obtained from field observation and transit survey. This information was presented in Section 1.2 - A.1.

3. Outlet Works: The dam does not have a reservoir drain. A pump is sometimes used to cycle clarified water for reuse in quarry operations, but this is a temporary installation.

4. Spillways:

a. Principal Spillway: The principal spillway riser is located near the right abutment and is constructed of concrete. The riser has inside dimensions of approximately 6 feet by 6 feet and is 7 feet high. Two sides and the top of the riser are open with the top covered with a steel screen (See Photo No. 4). The weir crest openings on the sides of the riser maintain normal pool level at El. 234. The riser outlet consists of a 6 foot diameter corrugated metal pipe which discharges onto pieces of sheet metal and concrete rubble at the right embankment junction.

b. Emergency Spillway: The emergency spillway consists of an earth channel of trapezoidal shape excavated into the right abutment. The channel is about 40 feet wide, 400 feet long, and discharges about 150 feet downstream from the dam in the direction of Indian Creek. The spillway crest is at El. 234.3 and has 2 feet of freeboard.

2.2 CONSTRUCTION

A. CONTRACTOR: The dam was constructed by the Contee Sand and Gravel Company (owner).

B. CONSTRUCTION PERIOD: The exact period that the dam was constructed is unknown. Mr. James Payne, an employee of Contee Sand and Gravel Company, estimates that the dam was constructed around 1957.

C. FIELD CHANGES: A row of sheet piling was driven along the left abutment when Route 95 was constructed in 1968. The purpose of the sheet piling is to reduce the amount of seepage emanating toward Route 95.

D. CONSTRUCTION INSPECTION: There is no record of a construction inspection being performed.

2.3 OPERATION: The owner, Contee Sand and Gravel Company, Inc., is responsible for the operation of the dam. Flood discharge is uncontrolled and the dam does not have a reservoir drain.

2.4 EVALUATION

A. AVAILABILITY: Available design information and drawings were obtained from the Maryland Water Resources Administration, Dam Safety Division.

B. ADEQUACY: The available design information, supplemented by visual observations and reported performance history, is considered adequate for the purposes of this Phase I report.

C. VALIDITY: At this time, there is no evidence or reason to question the validity of the available design information and drawings.

SECTION 3
VISUAL INSPECTION

3.1 FINDINGS

A. GENERAL: The on-site reconnaissance of the Contee Main Settling Pond was performed on May 5, 1981 and consisted of:

1. Visual observations of the earth embankment, abutments, principal and emergency spillway.

2. Evaluation of the downstream hazard potential.

3. Visual observations of the reservoir shoreline, upstream settling ponds and downstream channel.

4. Transit stadia survey of relative elevations along the embankment crest, slopes, and spillway channel.

Visual observations were made when the reservoir was at normal pool level. A visual description checklist and field sketch are included in Appendix A. Specific observations are shown on photographs in Appendix C.

B. EMBANKMENT

1. Surficial: No significant structural deficiencies of the embankment were discernible. The embankment slopes are covered with grass and brush as well as several small trees (Photo No. 1). The crest of the embankment is unvegetated and is used as an access road (Photo No. 2).

2. Seepage: Seepage was observed emanating near the toe of the downstream embankment slope approximately 100 feet left of the right abutment. The flow rate of this seep was estimated to be about 10 gpm. There was no visible evidence of erosion channels or movement of soil fines. However, a dark red iron precipitate covered the seepage area and may have obscured the presence of soil fines or erosion. The immediate discharge area was saturated and very soft.

Several seeps were also noticed emanating from the right abutment at the outfall of the emergency spillway channel (See field sketch). The seepage flow from these seeps was also iron stained. The flow rate of each seep was estimated to be less than 1 gpm. No movement of soil fines or erosion channels were observed at the location of the seeps.

A 200 foot long row of sheet piling has been installed at the left abutment, presumably to reduce seepage and lower the phreatic surface in the direction of Route 95. However, the discharge of the pipe culvert that discharges near the toe of the downstream slope at the left abutment was also iron stained. At the culvert inlet on the northbound side of Route 95, the water entering the culvert was clear and the flow rate was much less. It was therefore suspected that a significant amount of seepage from the left abutment was entering the pipe culvert.

C. DOWNSTREAM CONDITIONS

1. Channel: There are three stream channels directly downstream from the dam. Two of these channels connect the principal spillway outlet pipe at the right abutment and the outlet of the pipe culvert at the left abutment to the main stream channel of Indian Creek (see field sketch). A third channel conveys spillway outflow and seepage emanating from the emergency spillway outfall to Indian Creek. These channels are about 4 to 8 feet wide and meander through very dense brush cover. Indian Creek is about 10 feet wide and also traverses a densely vegetated area before underpassing Route 95. About 500 feet of the Indian Creek channel upstream from Route 95 is concrete lined.

2. Development: Indian Creek passes under Route 95 about 2000 feet downstream from the dam. At this location, two concrete box culverts convey Indian Creek under Route 95. Between the dam and Route 95, there are 4 homes adjacent to and within a 10 foot elevation difference of Indian Creek. Indian Creek flows through the town of Beltsville about 2 miles downstream from the dam.

D. APPURTENANT STRUCTURES

1. Reservoir Drain: No evidence of a reservoir drain was noticed during the field reconnaissance.

2. Principal Spillway: The reinforced concrete intake riser is in good condition. The top of the riser is covered with a steel screen trash rack which is partially detached from the riser (Photo No. 4). The 6 foot diameter corrugated metal outlet pipe discharges at the junction of the embankment and right abutment onto pieces of corrugated metal (Photo No. 5). Broken concrete and asphalt rubble were placed at this junction for erosion protection.

3. Emergency Spillway: The emergency spillway channel is excavated into sand and gravel soil at the right abutment and is partially covered with grass and brush (Photo No. 6). There are many areas along the bottom and sides of the channel that are barren. Fallen tress and other debris were observed in the channel. At the channel outfall, there is a drop of about 15 feet to the level of the downstream channel that conveys the seepage emanating from this area to Indian Creek.

E. RESERVOIR: The reservoir is used as a sedimentation pond and is almost completely filled with sediment. About 2/3 of the reservoir area at normal pool level is covered by grass and cattails. The slopes of the sedimentation pond have moderate inclination and have sparse vegetation cover along most of the pond perimeter. Upstream from the main settling pond, there are numerous other sediment control basins that drain into the main settling pond.

3.2 EVALUATION

A. EMBANKMENT: The seep located at the downstream toe of the embankment and the suspected seepage at the left abutment entering the pipe culvert are not considered to represent a serious hazard at this time. However, there is concern that seepage flow in these areas

may cause a piping condition to develop. Flow from the seep at the embankment toe should be monitored and corrections made if evidence of piping is noted.

Seepage entering the pipe culvert also has the potential to cause a piping condition to develop. The inside of the culvert should be inspected for evidence of seepage transporting soil fines into the culvert and appropriate corrections made if required.

The other seeps located at the outfall of the emergency spillway channel are believed attributable to hillside springs and are not considered to present a hazard to the embankment at this time.

There is also the possibility that the numerous trees growing from the embankment may contribute to embankment instability. All trees growing from the embankment should be removed.

B. APPURTENANT STRUCTURES

1. Principal Spillway: The concrete principal spillway riser has a partially detached steel screen cover which serves as a trash rack. This steel screen is in need of repair. The principal spillway outlet pipe discharges at midslope onto corrugated metal sheets and concrete and asphalt rubble. This arrangement may be prone to damage during full spillway discharge. The spillway would then discharge directly onto the embankment slope and cause erosion and possible embankment failure. A more permanent means of preventing embankment erosion from principal spillway discharge is required.

2. Emergency Spillway: The emergency spillway channel has many barren areas that would be subject to erosion during spillway discharge. These areas are in need of erosion protection. The trees and other debris in the spillway channel should be removed.

SECTION 4
OPERATIONAL FEATURES

4.1 PROCEDURE: Normal pool level is maintained by the uncontrolled weir crest openings of the principal spillway riser. The dam does not have any operational features.

MAINTENANCE OF DAM: The dam is maintained by the owner; Contee Sand and Gravel Company Inc. Maintenance is generally performed on an "as needed" basis.

INSPECTION OF DAM: Formal inspections of the dam are not generally conducted. Personnel of Contee Sand and Gravel do, however, frequent the settling pond area to obtain water samples of the spillway discharge and operate the diesel powered pump. The condition of the dam and appurtment structures is normally casually observed on these occasions.

WARNING SYSTEM: There is no warning system or formal emergency procedure to alert downstream inhabitants of the threat of a dam failure.

EVALUATION: In general, maintenance procedures at the Contee Main Settling Pond Dam are considered marginal based on the observed deficiencies. A more thorough maintenance program should be developed.

A formal inspection program should also be instituted at the dam facility. In addition, a formal flood surveillance and warning plan is needed for the protection of downstream residents.

SECTION 5
HYDROLOGY AND HYDRAULICS

5.1 AVAILABLE INFORMATION

A. DESIGN DATA: The Contee Main Settling Pond has a watershed area of 691 acres which is primarily sand and gravel quarry. The watershed has a maximum elevation of 390 feet above mean sea level. The dam crest varies from El. 236.3 to El. 241.9. At elevation 236.3, the dam can impound 62 acre-feet.

B. EXPERIENCE DATA: Records of reservoir levels are not maintained at the dam facility. The embankment reportedly has never been overtopped. The maximum depth of flow observed in the emergency spillway channel was reported to be about 2 feet.

C. VISUAL OBSERVATIONS: Except for fallen trees and other debris in the emergency spillway channel, no deficiencies were observed that would prevent the principal and emergency spillways from functioning as intended. The transit survey of the embankment crest and left abutment indicated that the lowest point on the embankment crest is at the left abutment junction near Interstate Route 95.

D. OVERTOPPING POTENTIAL: The Corps of Engineers guidelines recommend a spillway design flood (SDF) of 50 percent to 100 percent PMF (Probable Maximum Flood) for "small" size "high" hazard dams. With adjustments for watershed size, the rainfall amount for the 100 percent PMF is 22.1 inches/6 hours according to Hydrometeorological Report No. 33. The 50 percent PMF was selected as the spillway design flood because of the relatively small maximum storage volume of 62 acre-feet and shallow reservoir depth.

In order to evaluate if runoff from the 50 percent PMF would overtop the embankment, an analysis was performed using the HEC-1 Dam Safety Version computer program. It was found that the dam can hydraulically pass 10 percent of PMF runoff without overtopping the lowest point of the embankment crest. Runoff from the 50 percent PMF would overtop the embankment by a maximum depth of 1.2 feet and for a duration of 8.7 hours.

A maximum stage level of 0.7 feet above the embankment crest was considered sufficient to initiate a dam breach. Accordingly, a breach and non-breach dam safety analysis was performed in order to evaluate downstream flood levels for these conditions. Based on the breach criteria described above, it was found that the dam breach would occur with 40 percent PMF runoff and that flood levels for 40 percent PMF runoff at the damage center, (see Station 2 on Location Plan) would increase by 1.5 feet. A summary of the dam safety analyses are included in Appendix D. A drawing showing Station 1 and Station 2 cross-sections is also included in Appendix D.

5.2 EVALUATION: The 50 percent PMF was selected as the spillway design flood because of the relatively small maximum storage volume of 62 acre-feet and shallow reservoir depth. The dam can only pass 10 percent of PMF runoff without overtopping and it is estimated that 40 percent of PMF runoff would cause a dam breach. Due to the small amount of water impounded, however, the maximum flood level in the vicinity of Route 95 would only increase by 1.5 feet during a dam breach. A flood

level increase of 1.5 feet is not considered sufficient to increase the inundation of residential structures or Route 95 at the damage center location. The spillway system of the dam is therefore considered inadequate, but not seriously inadequate, in accordance with guideline criteria.

SECTION 6
STRUCTURAL STABILITY

6.1 AVAILABLE INFORMATION

A. DESIGN AND CONSTRUCTION DATA: The available data did not include any information on the design or construction of the dam. Conversation with Contee Sand and Gravel Company, Inc. personnel indicated that the dam was constructed of predominately sand and gravel soil obtained from quarry operations.

B. OPERATING RECORDS: Operating records are not maintained at the dam facility.

C. POST CONSTRUCTION CHANGES: A 200 foot long row of sheet piling was installed in the left abutment during 1968 in order to reduce seepage. This is the only known modification to the dam.

6.2 EVALUATION

A. DESIGN DOCUMENTS: The available information did not contain any design data or evaluation of structural stability.

B. VISUAL OBSERVATIONS: No evidence of embankment instability was noted during the site reconnaissance. The seep located at the downstream toe of the embankment and the suspected seepage at the left abutment entering the pipe culvert could cause a piping condition to develop. Piping in either area could cause the embankment to be unstable. The discharge from the principal spillway outlet also has the potential to cause embankment instability. As discussed in Section 3.2-B1, principal spillway discharge onto the downstream embankment slope without suitable erosion protection could cause the embankment to fail.

C. PERFORMANCE: The embankment has reportedly never been overtopped and has been structurally stable since its construction in 1957.

D. SEISMIC STABILITY: The dam is located in Seismic Zone 1, an area of low seismic probability. Based on this low seismic probability and recommended criteria for the evaluation of seismic stability of dams, the stability of the embankment is presumed adequate under earthquake conditions.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS

7.1 ASSESSMENT

A. EVALUATION

1. Maintenance: The maintenance procedures at the Contee Main Settling Pond Dam are considered marginal based on the following observed deficiencies:

   a. There are numerous trees growing from the embankment.

   b. The steel screen trash rack of the principal spillway riser is partially detached.

   c. There are fallen trees and other debris obstructing the emergency spillway channel.

2. Erosion Protection: The erosion protection provisions for the principal spillway outlet would be prone to damage during full spillway discharge. If damaged, the spillway discharge would cause erosion and possible embankment failure. A more permanent means of preventing embankment erosion from prinicipal spillway discharge is required. The bottom and sides of the emergency spillway channel have barren areas that would also be prone to erosion. These areas are in need of erosion protection.

3. Embankment Stability: The seep located at the downstream toe of the embankment and the suspected seepage at the left abutment entering the pipe culvert are not considered to represent a serious hazard at this time. However, there is concern that seepage flow in these areas may cause a piping condition to develop. Piping in either area could cause the embankment to be unstable.

4. Overtopping Potential: The "small" size, "high" hazard classification of the dam dictates a spillway design flood of 50 percent to 100 percent PMF. The 50 percent PMF was selected as the design flood because of the relatively small storage volume of 62 acre-feet and shallow reservoir depth. The dam can only pass 10 percent of PMF runoff without overtopping. A maximum stage level of 0.7 feet above the embankment crest was considered sufficient to initiate a dam breach. Based on this breach criteria, it was found that the dam breach would occur with 40 percent PMF runoff and that the breach would cause an increase in flood level of 1.5 feet at the damage center. This flood level increase is not considered sufficient to increase the inundation of residential structures or Route 95. The spillway system is therefore considered inadequate, but not seriously inadequate, according to guideline criteria.

B. ADEQUACY OF INFORMATION: The available information was considered adequate to conduct a Phase I study.

C. URGENCY: The recommendations presented in Section 7.2 should be implemented as soon as possible.

D. NECESSITY FOR ADDITIONAL STUDY: The dam owner should initiate additional studies by a professional engineer experienced in the design of dams to more accurately ascertain spillway channel adequacy and the extent of improvements required to provide sufficient discharge capacity or erosion/breaching protection for the dam. A plan for an improved means of erosion protection of the embankment at the principal spillway outlet is also required.

7.2 RECOMMENDATIONS

A. DAM AND APPURTENANT STRUCTURES

1. Implement additional studies by a professional engineer to evaluate the extent of improvements required to provide sufficient discharge capacity or erosion/breaching protection for the dam. A plan to provide adequate erosion protection of the embankment at the principal spillway outlet should also be devised. Improvements found necessary by the recommended study should be implemented immediately.

2. Monitor the seep located at the downstream embankment toe. If increased flow quantity or evidence of piping is observed, the Maryland Water Resources Administration , Dam Safety Division should be notified immediately, and necessary corrective repairs made.

3. The inside of the pipe culvert at the left abutment should be inspected for evidence of seepage transporting soil fines into the culvert (piping). If evidence of piping is observed, the Maryland Water Resources Administration, Dam Safety Division, should be notified immediately, and necessary corrective repairs made.

4. Develop and implement measures to prevent erosion of barren areas in the emergency spillway channel.

5. Remove the trees growing from the embankment and repair the steel screen trash rack of the principal spillway riser. Also, clear fallen trees and other debris from the emergency spillway channel.

B. OPERATION AND MAINTENANCE PROCEDURES

1. Develop a formal flood surveillance and warning plan to advise downstream residents when high flows are expected. The plan should also include an evacuation procedure.

2. Implement a more thorough maintenance program to regularly remove future tree growth from the embankment and debris obstructing the principal and emergency spillways.

APPENDIX A

VISUAL OBSERVATIONS CHECK LIST AND FIELD SKETCH

VISUAL OBSERVATION CHECK LIST

Name Dam Contee Main Settling Pond County Prince Georges State Maryland National ID # MD00081

Type of Dam Earthfill Hazard Category High Hazard

Date(s) Inspection May 5, 1981 Weather Hot, Clear Temperature 78° ±

Inspection Review Date June 3, 1981

Pool Elevation at Time of Inspection Normal* Tailwater at Time of Inspection Normal M.S.L.

Inspection Personnel:

Jim Payne	Contee Sand & Gravel Co.
Brian Clevenger	Maryland Department of Natural Resources, Dam Safety Division
Kirk Cover	Maryland Department of Natural Resources, Dam Safety Division
Larry Miller	Ackenheil & Associates Baltimore, Maryland, Inc.
Timothy E. Debes	Ackenheil & Associates Baltimore, Maryland, Inc.
James D. Hainley	Ackenheil & Associates Baltimore, Maryland, Inc.
Paul A. D'Amato	Ackenheil & Associates Baltimore, Maryland, Inc.

Recorder Timothy E. Debes

*Approximately 2 feet of standing water.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS*
SURFACE CRACKS	None observed. However, dense grass and brush cover on downstream embankment slope may have obscured evidence of cracks or slope distress.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None observed.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Transit survey indicated that dam crest varies from El 236.3 to El. 241.9. No significant horizontal misalignment noted.	
RIPRAP FAILURES	Riprap consisting of concrete and asphalt debris, observed on spillway-embankment junction sideslope and discharge outlet areas for principal spillway pipe and emergency spillway channel.	*REFER TO REPORT SECTIONS 3 AND 7

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SETTLEMENT	None observed.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Spillway-embankment junction was observed lined with heterogeneous concrete and asphalt debris for erosion protection. Embankment-abutment junction observed to have a dense grass covering.	
ANY NOTICEABLE SEEPAGE	Seepage observed emanating from downstream embankment slope, approximately 100 feet left of the right abutment. Seepage flow was observed free of soil fines, but did include dark red iron precipitate particles. Flow rate was estimated at 10 gpm. Iron stained water was also observed in the spillway waste channel. Several individual discharges were observed to emanate from the hillside. These discharges were free of soil fines and had estimated flow rates of less than 1 gpm. During the June 3, 1981 inspection, the discharge from the culvert that outlets near the downstream embankment toe at the left abutment was also stained by a dark red iron precipitate. At the culvert inlet on the northbound side of Route 95, the water was clear and the flow rate was much less.	
STAFF GAGE AND RECORDER	None	
DRAINS	None observed or reported	

PRINCIPAL SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Principal spillway outlet consisted of coated, corrugated metal pipe sections. Exposed pipe sections were observed in good condition.	
INTAKE STRUCTURE	Principal spillway inlet consisted of a concrete constructed, weir controlled, intake riser with a steel grate roof. Exterior concrete surfaces were observed in good condition. However, the steel roof grate was partially separated from the concrete sidewalls.	
OUTLET STRUCTURE	Outlet pipe sections appeared to be poorly supported and consisted of full-circle and semi-circular connected corrupted metal pipe sections.	
OUTLET CHANNEL	Outlet channel sideslopes are partially eroded and lined with heterogeneous concrete and asphalt debris of erosion protection.	
EMERGENCY GATE	None.	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	N/A	
APPROACH CHANNEL	Approach channel consisted of an excavated earth channel with sparse grass cover. Wood debris and a large tree trunk were found scattered across the channel and along the right spillway sideslope.	
DISCHARGE CHANNEL	Channel bottom and sideslopes were observed in fair condition, with a sparse grass cover. A narrow gully was eroded in the spillway channel along the left spillway sideslope.	
BRIDGE AND PIERS	None.	

INSTRUMENTATION

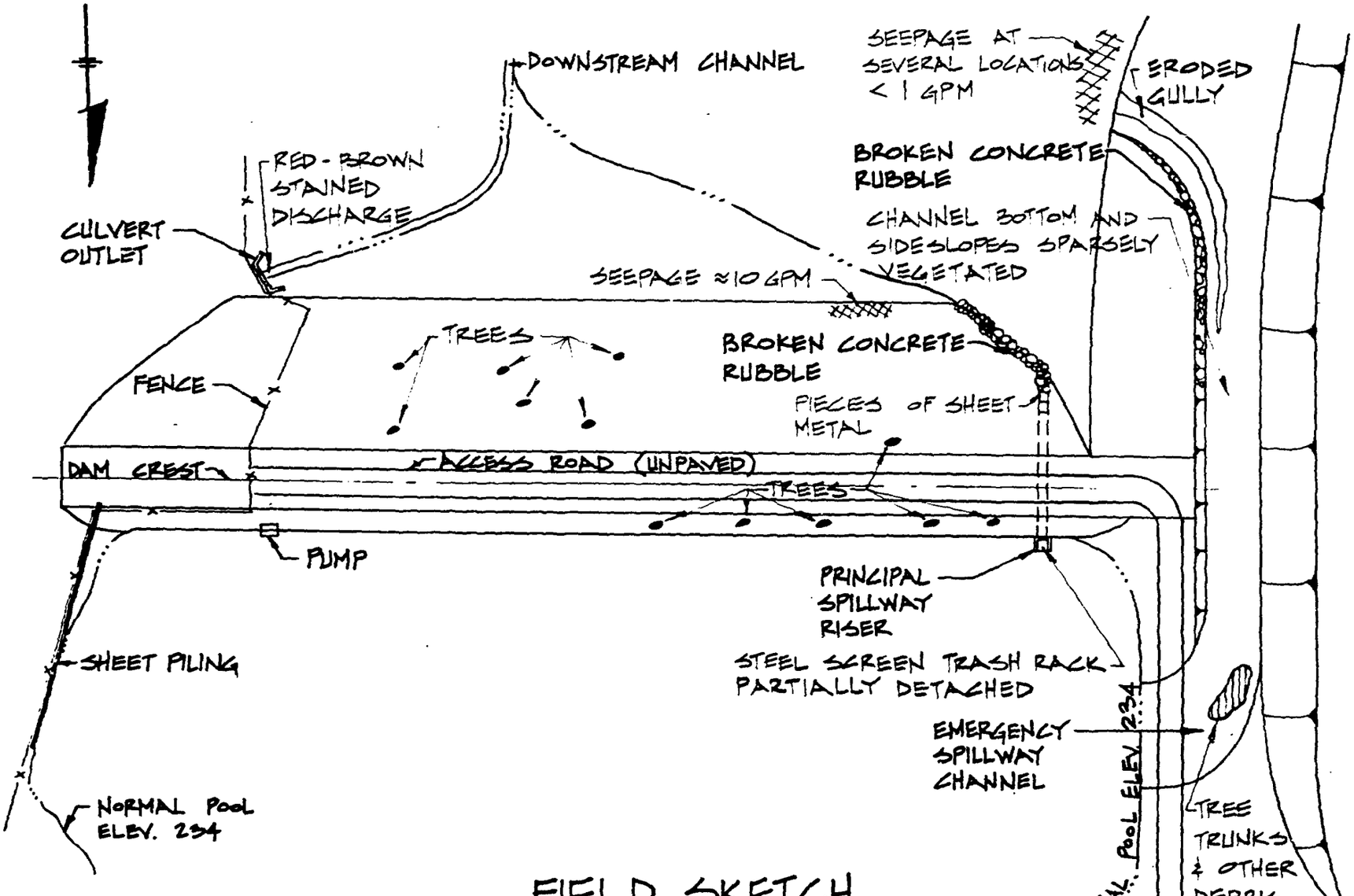
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None observed or reported.	
OBSERVATION WELLS	None observed or reported.	
WEIRS	None observed or reported.	
PIEZOMETERS	None observed or reported.	
OTHER	N/A	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Reservoir slopes and shoreline appeared generally stable, but had only sparse vegetation cover along most of the settling pond perimeter.	
SEDIMENTATION	Dam facility served as a settling pond impoundment for sand and gravel washing processes, and as such, has a heavy sediment accumulation. Sediment acculumation is presently within one or two feet of normal pool level elevation.	

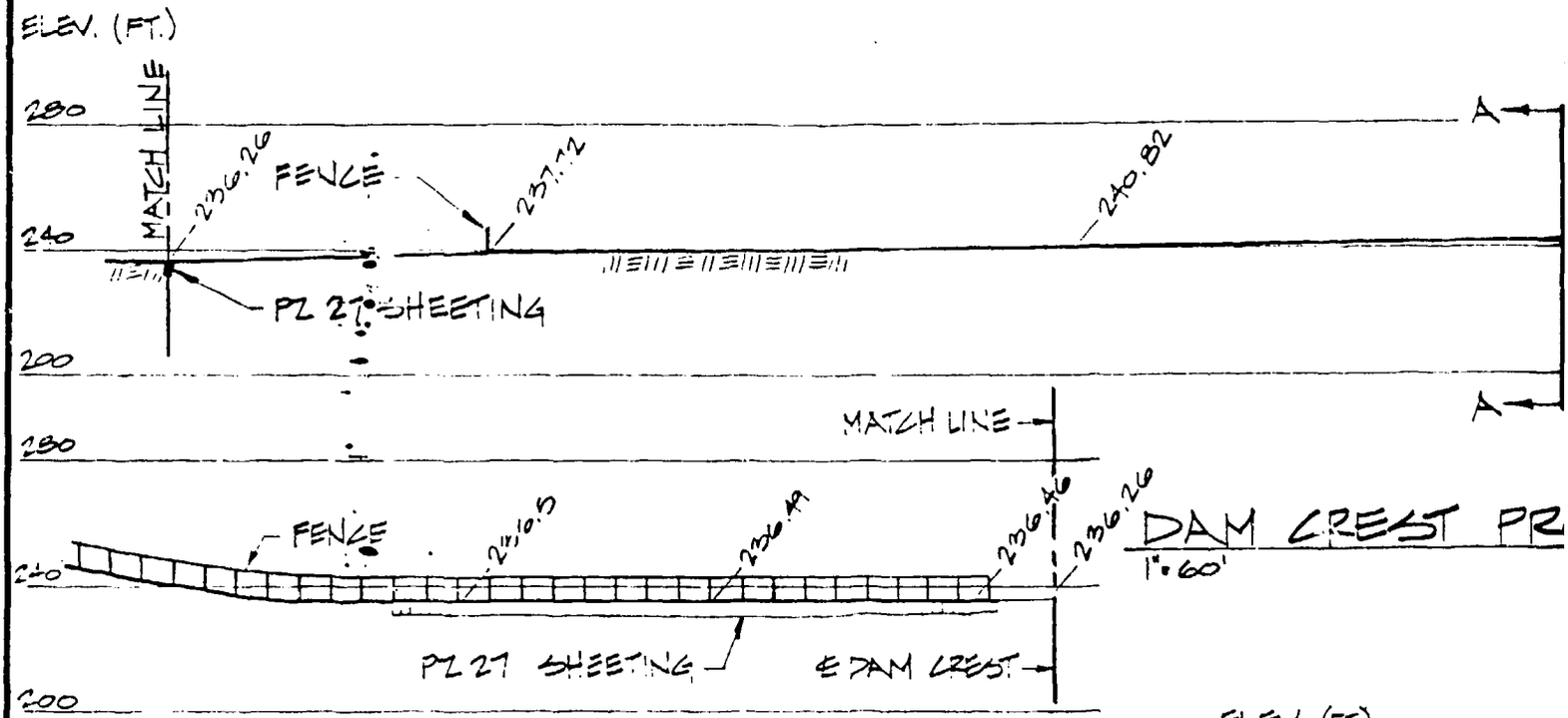
DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Downstream channel directly below dam is approximately 10 feet wide, and free of significant flow obstructions, until the stream channel underpasses I-95 via concrete box culverts.	
SLOPES	Indian Creek stream channel has mild to moderate side slopes vegetated with grass and brush, and in alluvial gravel surfaced bottom.	
APPROXIMATE NO. OF HOMES AND POPULATION	Approximately two (2) inhabited dwellings and Interstate 95, a major north-south highway, are located on the floodplain below the dam within a distance of 2000 feet.	



FIELD SKETCH

CONTEE MAIN SETTLING POND DAM



DAM CREST PR

1" = 60'

LEFT ABUTMENT PROFILE

1" = 60'

ELEV. (FT.)

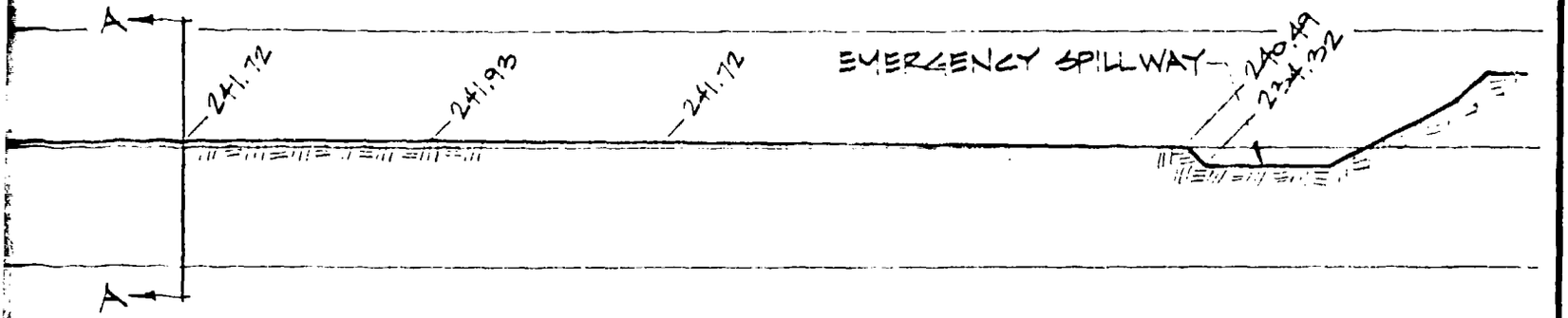
250

230

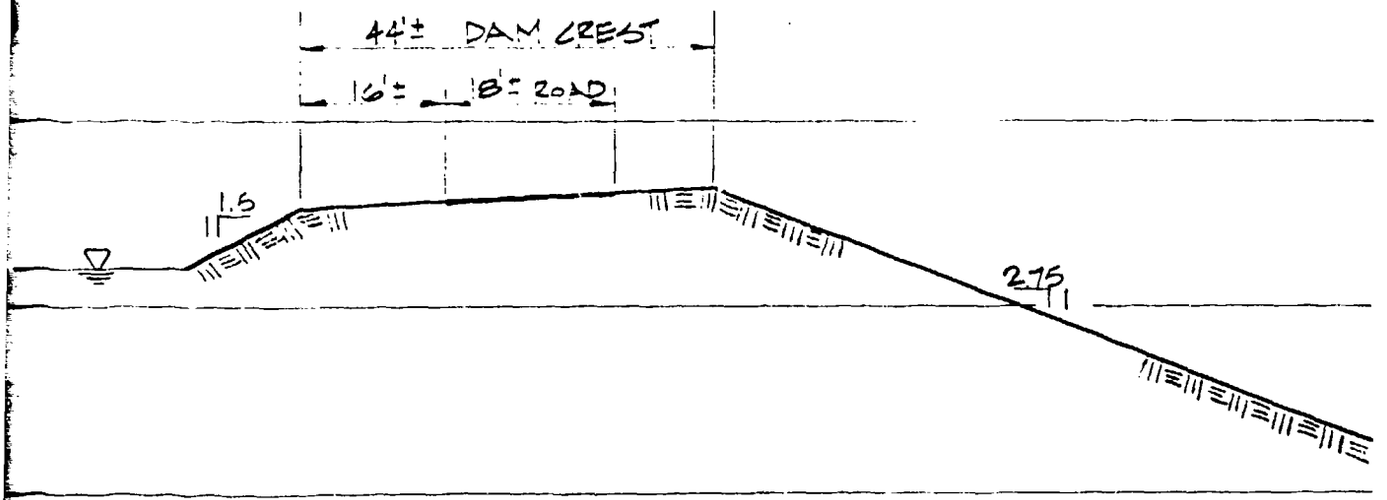
210

NOTE:

SEE FIELD SKETCH FOR PLAN.



EST PROFILE LOOKING DOWNSTREAM



SECTION A-A
1" = 20'

DATE: JUNE 29, 981	CONTEE MAIN SETTLING POND DAM NATIONAL DAM INSPECTION PROGRAM	DAM CREST PROFILE AND SECTION
SCALE: AS SHOWN		
DR: JLM CK: PAD	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS GEO SYSTEMS, INC. 1000 BANKSVILLE RD / PITTSBURGH PA 15216	
DWG. NO. A-10		

2

APPENDIX B

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE 1

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE 1

NAME OF DAM Contee Main Settling Pond

ID # NDI MD00081

ITEM	REMARKS
AS-BUILT DRAWINGS	Only design drawing showing sediment control plan for Contee property.
REGIONAL VICINITY MAP	See Appendix E, U.S.G.S. 7.5 min. quadrangle map showing site location.
CONSTRUCTION HISTORY	Built in 1957 by Contee Sand and Gravel.
TYPICAL SECTIONS OF DAM	See Field Sketch.
OUTLETS - PLAN	See Plate No. 1 and Field Sketch.
DETAILS	None
CONSTRAINTS	None
DISCHARGE RATINGS	None
RAINFALL/RESERVOIR RECORDS	None

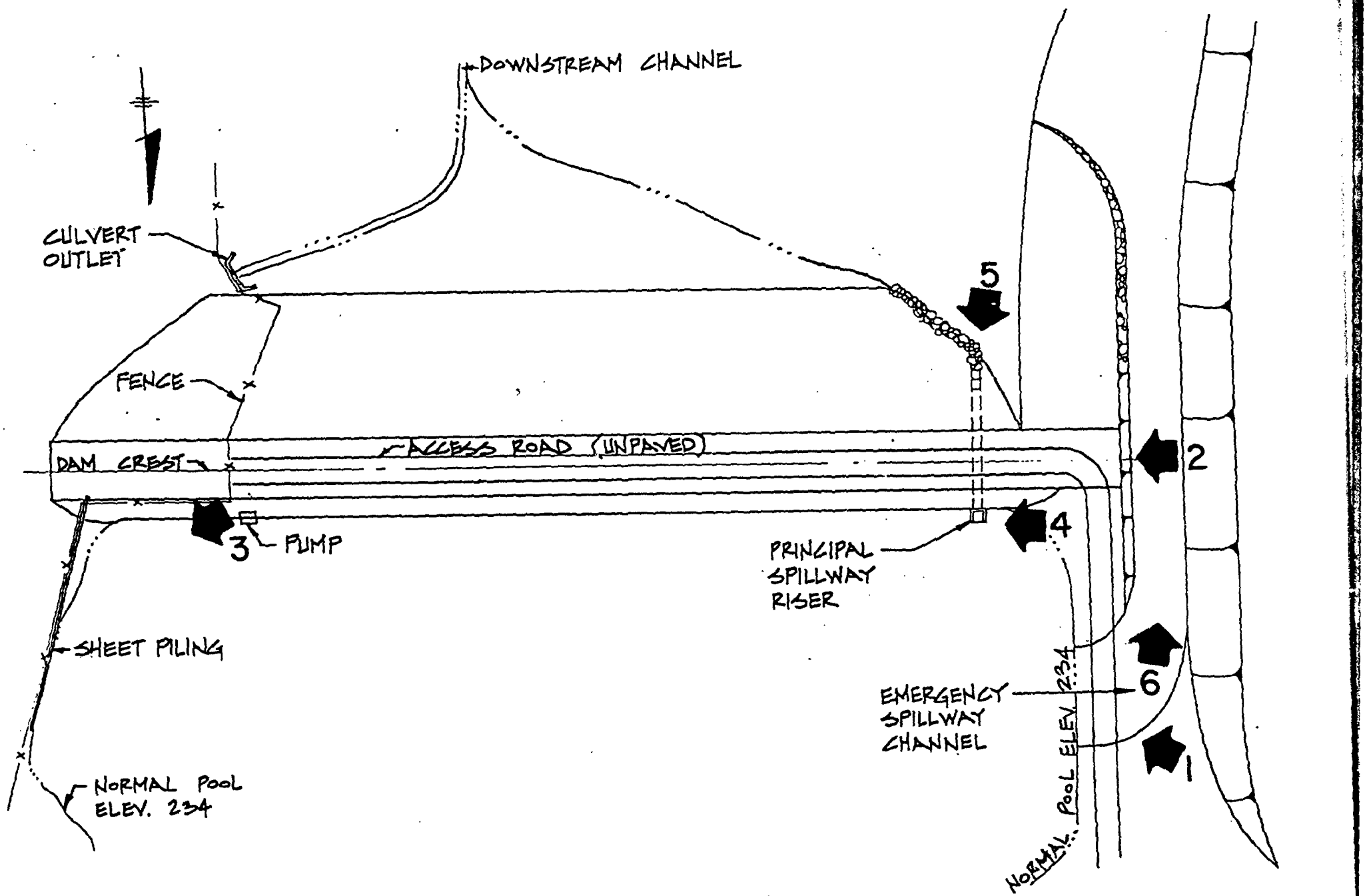
ITEM	REMARKS
DESIGN REPORTS	None.
GEOLOGY REPORTS	None.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None.
POST-CONSTRUCTION SURVEYS OF DAM	None.
BORROW SOURCES	Embankment constructed from predominately sand and gravel soils obtained on-site.

ITEM	REMARKS
MONITORING SYSTEMS	None reported.
MODIFICATIONS	Sheet piling installed at left abutment adjacent to Route 95 during 1968.
HIGH POOL RECORDS	None reported.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None reported.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None reported.
MAINTENANCE OPERATION RECORDS	Not maintained.

ITEM	REMARKS
SPILLWAY PLAN	See Field Sketch.
SECTIONS	None.
DETAILS	None.
OPERATING EQUIPMENT PLANS & DETAILS	Pump used to recycle clarified water.
SPECIFICATIONS	None
MISCELLANEOUS	The elevations shown on Plate No. 1 are about 13 feet greater than elevations based on Mean Sea Level shown on the U.S.G.S. 7½ min. topographic map.

APPENDIX C

PHOTOGRAPHS

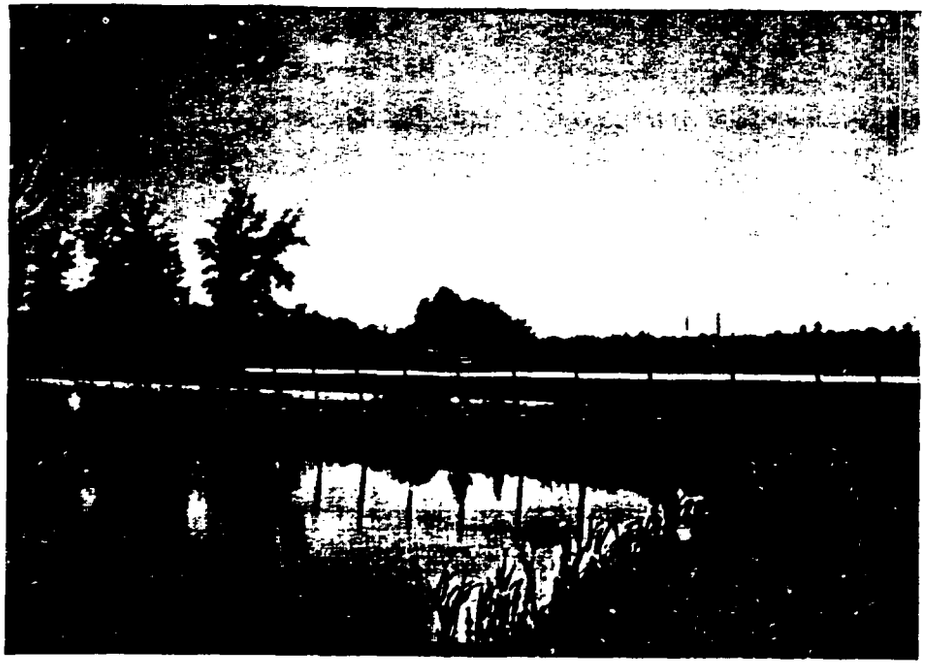


PHOTOGRAPH KEY MAP

PHOTOGRAPH 1	View of upstream slope of embankment from right abutment.
PHOTOGRAPH 2	View of embankment crest from right abutment.
PHOTOGRAPH 3	View of sheet piling installed at left abutment.
PHOTOGRAPH 4	Principal spillway intake riser.

1

2



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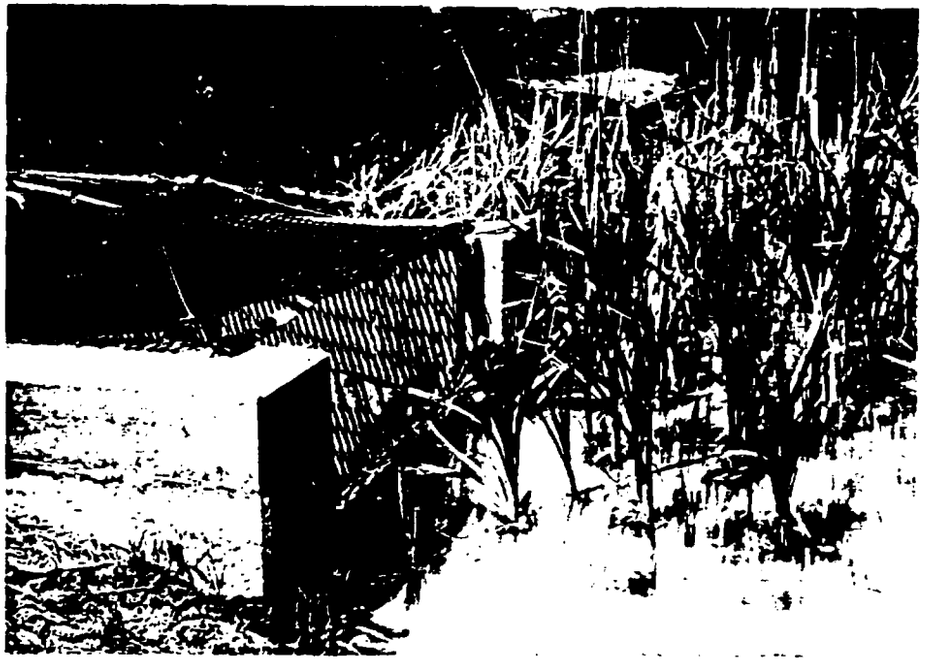

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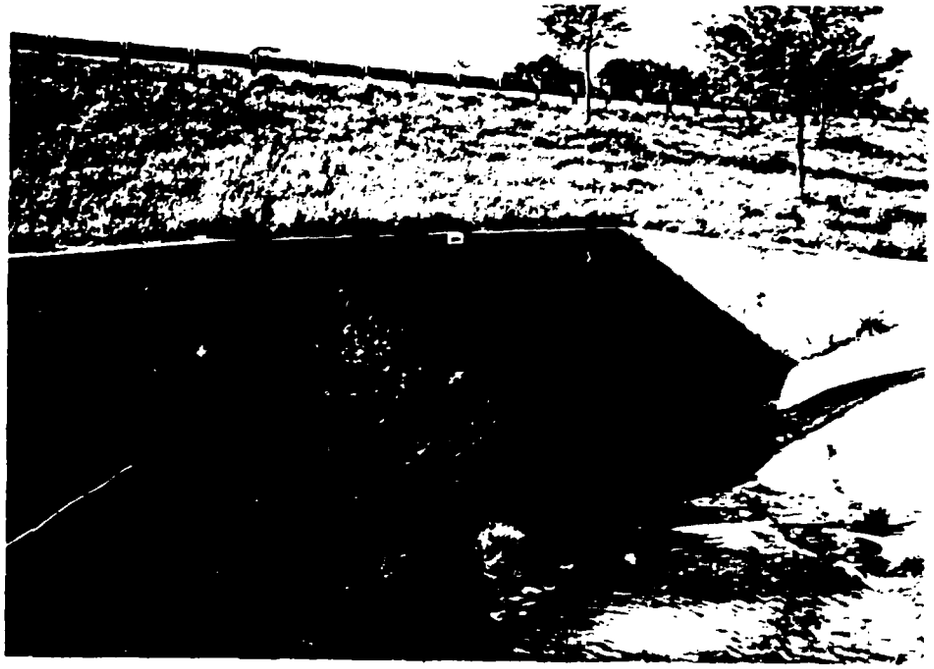
PHOTOGRAPH 5	Principal spillway outlet pipe. Note that pipe discharges onto pieces of sheet metal.
PHOTOGRAPH 6	View of emergency spillway channel looking downstream.
PHOTOGRAPH 7	Residence located about 2000 feet downstream from dam.
PHOTOGRAPH 8	View of box culverts at the intersection of Indian Creek and Route 95 (2000 feet downstream from dam).

5

6

7



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APPENDIX D

HYDROLOGIC AND HYDRAULIC ENGINEERING AND COMPUTER DATA

APPENDIX D
HYDROLOGY AND HYDRAULICS

Methodology: The dam overtopping analysis was accomplished using the systemized computer program HEC-1 (Dam Safety Version), July, 1978, prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California. A brief description of the methodolgoy used in the analysis is presented below.

1. Precipitation: The Probable Maximum Precipitation (PMP) is derived and determined from regional charts prepared from past rainfall records including "Hydrometeorological Report No. 33" prepared by the U.S. Weather Bureau.

   The index rainfall is reduced from 10% to 20% depending on watershed size by utilization of what is termed the HOP Brook adjustment factor. Distribution of the total rainfall is made by the computer program using distribution methods developed by the Corps of Engineers.

2. Inflow Hydrograph: The hydrologic analysis used in development of the overtopping potential is based on applying a hypothetical storm to a unit hydrograph to obtain the inflow hydrograph for reservoir routing.

   The unit hydrograph is developed using the Snyder method. This method requires calculation of several key parameters. The following list give these parameters, their definition and how they were obtained for these analyses.

Parameter	Definition	Where Obtained
t	Coefficient representing variations of watershed	From Corps of Engineers *
L	Length of main stream channel	From U.S.G.S. 7.5 minute topographic map
L_{ca}	Length on main stream to centroid of watershed	From U.S.G.S. 7.5 minute topographic map
C_p	Peaking coefficient	From Corps of Engineers *
A	Watershed size	From U.S.G.S. 7.5 minute topographic map

3. Routing: Reservoir routing is accomplished by using Modified Puls routing techniques where the flood hydrograph is routed through reservoir storage. Hydraulic capacities of the outlet works, spillways and the crest of the dam are used as outlet controls in the routing.

The hydraulic capacity of the outlet works can either be calculated and input or sufficient dimensions input and the program will calculate an elevation-discharge relationship.

Storage in the pool area is defined by an area-elevation relationship from which the computer calculates storage. Surface areas are either planimetered from available mapping or U.S.G.S. 7.5 minute series topgraphic maps or taken from reasonably accurate design data.

4. Dam Overtopping: Using given percentages of the PMF the computer program will calculate the percentage of the PMF which can be controlled by the reservoir and spillway without the dam overtoppping.

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* Developed by the Corps of Engineers on a regional basis for Pennsylvania and Maryland.

HYDROLOGIC AND HYDRAULIC ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Sand and gravel quarry.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 234.0 (5.2 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 236.3 (62 acre-feet)

ELEVATION MAXIMUM DESIGN POOL: 236.3 (62 acre-feet)

ELEVATION TOP DAM: 236.3 to 241.9

EMERGENCY SPILLWAY

a. Elevation 234.3 feet
b. Type Trapezoidal shape overflow spillway
c. Width 40 feet
d. Length 550 feet
e. Location Right abutment
f. Number and Type of Gates None

PRINCIPAL SPILLWAY

a. Type Concrete weir inlet structure with outflow pipe thru embankment
b. Location Near right abutment
c. Entrance Invert El. 234
d. Exit Invert El. 220 (approximate)
e. Emergency Drawdown Facilities None
f. Outlet Works None

HYDROMETEOROLOGICAL GAGES

a. Type None
b. Location
c. Records

MAXIMUM NON-DAMAGING DISCHARGE 350 cfs.

HEC-1-DAM SAFETY VERSION
HYDROLOGY AND HYDAULIC ANALYSIS
DATA BASE

NAME OF DAM:	Contee Main Settling Pond NDI ID. No. MD 00081
Probable Maximum Precipitation (PMP for 24 hr., 200 sq. mi.)	24.5 inch
Drainage Area	1.08 sq. mi.
Reduction of PMP Rainfall for Data Fit Reduce by 20% therefore PMP rainfall =	 19.6 inch
Adjustments of PMF for Drainage Area	
6 hrs.	113%
12 hrs.	124%
24 hrs.	132%
48 hrs.	142%
Snyder Unit Hydrograph Parameters	
Zone	33A
C_p	0.50
C_t	2.5
L	1.6 mile
L_{ca}	0.8 mile
$t_p = C_t (L \cdot L_{ca})^{0.3}$	2.7 hour
Loss Rates	
Initial Loss	1.0 in.
Constant Loss Rate	0.05 inch/hour
Basic Flow Generation Parameters	
Flow at Start of Storm	1.5 cfs/sq. mi.
Base Flow Cutoff	0.05 inch/hour
Recession Ratio	2.0
Overflow Section Data	
Crest Length	40 feet
Freeboard	2.0 feet
Discharge Coefficient	3.1
Exponent	1.5
Discharge Capacity	350 cfs
Breach Parameters	
Section Width	100 feet
Section Height	3.3 feet
Duration of Failure	15 min.
Depth of Maximum Overtopping Prior to Failure	0.7 feet

*Hydrometerological Report 33
**Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's Coefficients (Cp and Ct).

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  26 FEB 79
**********
A1   NON-BREACH ANALYSIS OF CONTEE MAIN SETTLING POND
A2   BELTSVILLE,MARYLAND
A3   10 to 100 PERCENT PMF - UNIT HYDROGRAPH BY SNYDER METHOD
B    300       0      10       0       0       0       0       0      -4       0
B1     5       0       0       0       0       0       0       0       0       0
J      1       9       1
J1   0.1     0.2     0.3     0.4     0.5     0.6     0.8     0.9     1.0       0
K      0    LAKE                       0       0       1       0
K1   INFLOW HYDROGRAPH FOR SETTLING POND
M      1       1    1.08               0       0                               0
P      0    24.5     113     124     132     142
T                                                    1.0    0.05
W    2.7    0.50
X   -1.5   -0.05     2.0
K      1     DAM                       0       0       1       0
K1   MOD PULS ROUTING OF FLOW THRU SETTLING POND
Y                              1       1
Y1     1                                             5.2       0
$S     0     5.2   153.7   234.9   631.3
$E   233     234     240   241.7     250
$$ 234.3      40     3.1     1.5
$D 236.3     3.1     1.5     0.0
$L   0.0     340     590    1090    1110
$V 236.3   237.7   240.8   241.9     245
K      1   STA 1                                     1
K1   MOD PULS ROUTING OF FLOW FROM DAM TO STA. 6+00
Y                              1       1
Y1     1
Y6   0.1   0.035     0.1     200     240     600  0.0033
Y7     0     240     200     210     390     202     394     200     404     200
Y7   408     202     490     210     780     240
K      1   STA 2                                     1
K1   MOD PULS ROUTING OF FLOW FROM STA. 6+00 TO  STA. 17+00
Y                              1       1
Y1     1
Y6   0.1   0.035     0.1     190     210    1100  0.0091
Y7     0     210     160     200     390     192     394     190     404     190
Y7   408     192     500     200     600     210
K     99
A
A
A
A
A
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**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  26 FEB 79
**********************************

RUN  DATE: 15 JUN 81
RUN  TIME:  8.16. 0

NON-BREACH ANALYSIS OF CONTEE MAIN SETTLING POND
BELTSVILLE,MARYLAND
10 to 100 PERCENT PMF - UNIT HYDROGRAPH BY SNYDER METHOD

                         JOB SPECIFICATION
NQ      NHR     NMIN     IDAY      IHR     IMIN    METRC     IPLT     IPRT    NSTAN
300       0       10        0        0        0        0        0       -4        0

                       JOPER      NWT    LROPT    TRACE
                           5        0        0        0

                MULTI-PLAN ANALYSES TO BE PERFORMED
                    NPLAN= 1 NRTIO= 9 LRTIO= 1
RTIOS=    0.10    0.20    0.30    0.40    0.50    0.60    0.80    0.90    1.00

**********          **********          **********          **********

                       SUB-AREA RUNOFF COMPUTATION

            INFLOW HYDROGRAPH FOR SETTLING POND

ISTAQ    ICOMP    IECON    ITAPE     JPLT     JPRT    INAME   ISTAGE    IAUTO
 LAKE        0        0        0        0        0        1        0        0

                         HYDROGRAPH DATA
IHYDG     IUHG    TAREA     SNAP    TRSDA    TRSPC    RATIO    ISNOW    ISAME    LOCAL
    1        1     1.08      0.0     1.08      0.0      0.0        0        0        0

                          PRECIP DATA
SPFE      PMS       R6      R12      R24      R48      R72      R96
 0.0    24.50   113.00   124.00   132.00   142.00      0.0      0.0
TRSPC COMPUTED BY THE PROGRAM IS 0.800

                           LOSS DATA
LROPT    STRKR    DLTKR    RTIOL    ERAIN    STRKS    RTIOK    STRTL    CNSTL    ALSMX    RTIMP
    0      0.0      0.0     1.00      0.0      0.0     1.00     1.00     0.05      0.0      0.0

                      UNIT HYDROGRAPH DATA
                 TP=  2.70    CP=0.50    NTA=  0

                        RECESSION DATA
              STRTQ=    -1.50    QRCSN=    -0.05    RTIOR= 2.00

UNIT HYDROGRAPH100 END-OF-PERIOD ORDINATES, LAG=   2.71 HOURS, CP= 0.50  VOL= 0.98
   2.      7.     15.     24.     34.     45.     57.     70.     83.     95.
 106.    115.    122.    128.    132.    134.    133.    129.    123.    117.
 112.    107.    102.     98.     93.     89.     85.     81.     78.     74.
  71.     68.     65.     62.     59.     56.     54.     52.     49      47.
  45.     43.     41.     39.     37.     36.     34.     33.     31      30.
  28.     27.     26.     25.     24.     23.     22.     21.     20      19.
  18.     17.     16.     16.     15.     14.     14.     13.     13      12.
  11.     11.     10.     10.     10.      9.      9.      8.      8       8.
   7.      7.      7.      6.      6.      6.      5.      5.      5       5.
   5.      4.      4.      4.      4.      4.      3.      3.      3       3.
```

0 END-OF-PERIOD FLOW

MO.DA HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
SUM		27.83	25.43	2.40	97555.						
		(707.)	(646.)	(61.)	(2762.45)						

HYDROGRAPH ROUTING

MOD PULS ROUTING OF FLOW THRU SETTLING POND

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
DAM	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.0	0.0	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.0	0.0	0.0	5.	0

CAPACITY=	0.	5.	154.	235.	631.
ELEVATION=	233.	234.	240.	242.	250.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
234.3	40.0	3.1	1.5	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
236.3	3.1	1.5	0.

CREST LENGTH AT OR BELOW ELEVATION	0. 236.3	340. 237.7	590. 240.8	1090. 241.9	1110. 245.0

PEAK OUTFLOW IS 187. AT TIME 43.83 HOURS
PEAK OUTFLOW IS 395. AT TIME 43.50 HOURS
PEAK OUTFLOW IS 636. AT TIME 43.00 HOURS
PEAK OUTFLOW IS 870. AT TIME 42.67 HOURS
PEAK OUTFLOW IS 1096. AT TIME 42.67 HOURS
PEAK OUTFLOW IS 1319. AT TIME 42.50 HOURS
PEAK OUTFLOW IS 1765. AT TIME 42.50 HOURS
PEAK OUTFLOW IS 1987. AT TIME 42.50 HOURS
PEAK OUTFLOW IS 2209. AT TIME 42.50 HOURS

********* ********** ********** **********

HYDROGRAPH ROUTING

MOD PULS ROUTING OF FLOW FROM DAM TO STA. 6+00

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
STA 1	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.0	0.0	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.0	0.0	0.0	0.	0

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
0.1000	0.0350	0.1000	200.0	240.0	600.	0.00330

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
0.0 240.00 200.00 210.00 390.00 202.00 394.00 200.00 404.00 200.00
408.00 202.00 490.00 210.00 780.00 240.00

STORAGE
0.0 0.41 2.08 5.82 11.63 19.49 28.65 38.80 49.95 62.10
75.25 89.39 104.53 120.67 137.80 155.93 175.06 195.19 216.31 238.43

OUTFLOW
0.0 99.12 463.75 1264.92 2658.63 4831.08 7951.64 11866.12 16592.99 22157.57
28588.78 35917.47 44175.60 53395.67 63610.34 74852.44 87154.69 100549.69 115069.69 130746.75

STAGE
200.00 202.11 204.21 206.32 208.42 210.53 212.63 214.74 216.84 218.95
221.05 223.16 225.26 227.37 229.47 231.58 233.68 235.79 237.89 240.00

FLOW
0.0 99.12 463.75 1264.92 2658.63 4831.08 7951.64 11866.12 16592.99 22157.57
28588.78 35917.47 44175.60 53395.67 63610.34 74852.44 87154.69 100549.69 115069.69 130746.75

MAXIMUM STAGE IS 202.6
MAXIMUM STAGE IS 203.8
MAXIMUM STAGE IS 204.7
MAXIMUM STAGE IS 205.3
MAXIMUM STAGE IS 205.9
MAXIMUM STAGE IS 206.4
MAXIMUM STAGE IS 207.1
MAXIMUM STAGE IS 207.4
MAXIMUM STAGE IS 207.7

HYDROGRAPH ROUTING

MOD PULS ROUTING OF FLOW FROM STA. 6+00 TO STA. 17+00

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
STA 2	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.0	0.0	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.0	0.0	0.0	0.	0

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
0.1000	0.0350	0.1000	190.0	210.0	1100.	0.00910

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
0.0 210.00 160.00 200.00 390.00 192.00 394.00 190.00 404.00 190.00
408.00 192.00 500.00 200.00 600.00 210.00

STORAGE
0.0 0.32 0.76 1.91 4.20 7.60 12.13 17.79 24.58 32.49
41.48 51.24 61.74 72.96 84.90 97.58 110.98 125.11 139.97 155.55

OUTFLOW
0.0 47.03 164.60 399.55 793.32 1392.94 2238.81 3367.68 4813.82 6609.64
8854.63 11554.44 14646.01 18140.87 22051.25 26389.84 31169.59 36403.44 42104.53 48285.95

STAGE

190.00	191.05	192.11	193.16	194.21	195.26	196.32	197.37	198.42	199.47
200.53	201.58	202.63	203.68	204.74	205.79	206.84	207.89	208.95	210.00

FLOW

0.0	47.03	164.60	399.55	793.32	1392.94	2238.81	3367.68	4813.82	6609.64
8854.63	11554.44	14646.01	18140.87	22051.25	26389.84	31169.59	36403.44	42104.53	48285.95

MAXIMUM STAGE IS 192.2
MAXIMUM STAGE IS 193.1
MAXIMUM STAGE IS 193.8
MAXIMUM STAGE IS 194.3
MAXIMUM STAGE IS 194.7
MAXIMUM STAGE IS 195.1
MAXIMUM STAGE IS 195.7
MAXIMUM STAGE IS 196.0
MAXIMUM STAGE IS 196.3

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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OP.STA.	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 0.10	RATIO 2 0.20	RATIO 3 0.30	RATIO 4 0.40	RATIO 5 0.50	RATIO 6 0.60	RATIO 7 0.80	RATIO 8 0.90	RATIO 9 1.00
HYDRO	1.08	1	222.	443.	665.	887.	1108.	1330.	1773.	1995.	2216.
AT LAKE	(2.80)		(6.28)	(12.55)	(18.83)	(25.10)	(31.38)	(37.66)	(50.21)	(56.48)	(62.76)
ROUTED	1.08	1	187.	395.	636.	870.	1096.	1319.	1765.	1987.	2209.
TO DAM	(2.80)		(5.28)	(11.19)	(18.01)	(24.64)	(31.03)	(37.36)	(49.98)	(56.27)	(62.55)
ROUTED	1.08	1	186.	395.	636.	870.	1096.	1319.	1764.	1986.	2208.
TO STA 1	(2.80)		(5.28)	(11.18)	(18.00)	(24.62)	(31.04)	(37.34)	(49.94)	(56.24)	(62.53)
ROUTED	1.08	1	186.	395.	635.	869.	1095.	1319.	1763.	1984.	2205.
TO STA 2	(2.80)		(5.28)	(11.18)	(17.99)	(24.62)	(31.00)	(37.34)	(49.92)	(56.19)	(62.44)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	234.00	234.30	236.30
STORAGE	5.	13.	62.
OUTFLOW	0.	0.	351.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME FAILU HOU
0.10	235.61	0.0	45.	187.	0.0	43.83	0.0
0.20	236.46	0.16	66.	395.	2.50	43.50	0.0
0.30	236.96	0.66	78.	636.	5.67	43.00	0.0
0.40	237.25	0.95	86.	870.	7.33	42.67	0.0
0.50	237.46	1.16	91.	1096.	8.67	42.67	0.0
0.60	237.63	1.33	95.	1319.	9.67	42.50	0.0
0.80	237.91	1.61	102.	1765.	11.00	42.50	0.0
0.90	238.03	1.73	105.	1987.	11.17	42.50	0.0
1.00	238.13	1.83	107.	2209.	11.33	42.50	0.0

PLAN 1 STATION STA 1

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.10	186.	202.6	43.83
0.20	395.	203.8	43.50
0.30	636.	204.7	43.00
0.40	870.	205.3	42.83
0.50	1096.	205.9	42.67
0.60	1319.	206.4	42.67
0.80	1764.	207.1	42.50
0.90	1986.	207.4	42.50
1.00	2208.	207.7	42.50

PLAN 1 STATION STA 2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.10	186.	192.2	44.00
0.20	395.	193.1	43.67
0.30	635.	193.8	43.17
0.40	869.	194.3	42.83
0.50	1095.	194.7	42.67
0.60	1319.	195.1	42.67
0.80	1763.	195.7	42.67
0.90	1984.	196.0	42.67
1.00	2205.	196.3	42.67

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**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  26 FEB 79
**********
A1   BREACH ANALYSIS OF CONTEE MAIN SETTLING POND
A2   BELTSVILLE,MARYLAND
A3   10 to 100 PERCENT PMF - UNIT HYDROGRAPH BY SNYDER METHOD
B    300       0      10       0       0       0       0       0      -4       0
B1     5       0       0       0       0       0       0       0       0       0
J      1       9       1
J1   0.1     0.2     0.3     0.4     0.5     0.6     0.8     0.9     1.0       0
K      0    LAKE                       0       0       1       0
K1   INFLOW HYDROGRAPH FOR SETTLING POND
M      1       1    1.08               0       0                       0
P      0    24.5     113     124     132     142
T                                                    1.0    0.05
W    2.7    0.50
X   -1.5   -0.05     2.0
K      1     DAM                       0       0       1       0
K1   MOD PULS ROUTING OF FLOW THRU SETTLING POND
Y                              1       1
Y1     1                                             5.2       0
$S     0     5.2   153.7   234.9   631.3
$E   233     234     240   241.7     250
$$ 234.3      40     3.1     1.5
$D 236.3     3.1     1.5     0.0
$L   0.0     340     590    1090    1110
$V 236.3   237.7   240.8   241.9     245
$B   100    0.25     233    0.25     234     237
K      1   STA 1                                     1
K1   MOD PULS ROUTING OF FLOW FROM DAM TO STA. 6+00
Y                              1       1
Y1     1
Y6   0.1   0.035     0.1     200     240     600  0.0033
Y7     0     240     200     210     390     202     394     200     404     200
Y7   408     202     490     210     780     240
K      1   STA 2                                     1
K1   MOD PULS ROUTING OF FLOW FROM STA. 6+00 TO  STA. 17+00
Y                              1       1
Y1     1
Y6   0.1   0.035     0.1     190     210    1100  0.0091
Y7     0     210     160     200     390     192     394     190     404     190
Y7   408     192     500     200     600     210
K     99
A
A
A
A
A
A
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**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  26 FEB 79
**********

RUN  DATE: 12 JUN 81
RUN  TIME: 15.53. 0

    BREACH ANALYSIS OF CONTEE MAIN SETTLING POND
    BELTSVILLE,MARYLAND
    10 to 100 PERCENT PMF - UNIT HYDROGRAPH BY SNYDER METHOD

                              JOB SPECIFICATION
    NQ      NHR     NMIN     IDAY      IHR     IMIN    METRC     IPLT     IPRT    NSTAN
    300       0       10        0        0        0        0        0       -4        0
                                    JOPER      NWT   LROPT   TRACE
                                        5        0       0       0

                      MULTI-PLAN ANALYSES TO BE PERFORMED
                          NPLAN= 1 NRTIO= 9 LRTIO= 1
     RTIOS=   0.10   0.20   0.30   0.40   0.50   0.60   0.80   0.90   1.00

                              SUB-AREA RUNOFF COMPUTATION

           INFLOW HYDROGRAPH FOR SETTLING POND

STAQ    ICOMP    IECON    ITAPE     JPLT     JPRT    INAME   ISTAGE    IAUTO
LAKE        0        0        0        0        0        1        0        0

                              HYDROGRAPH DATA
IHYDG     IUHG    TAREA     SNAP    TRSDA    TRSPC    RATIO    ISNOW    ISAME    LOCAL
    1        1     1.08      0.0     1.08      0.0      0.0        0        0        0

                                PRECIP DATA
SPFE      PMS       R6      R12      R24      R48      R72      R96
 0.0    24.50   113.00   124.00   132.00   142.00      0.0      0.0
TRSPC COMPUTED BY THE PROGRAM IS 0.800

                                LOSS DATA
LROPT    STRKR    DLTKR    RTIOL    ERAIN    STRKS    RTIOK    STRTL    CNSTL    ALSMX    RTIMP
    0      0.0      0.0     1.00      0.0      0.0     1.00     1.00     0.05      0.0      0.0

                           UNIT HYDROGRAPH DATA
                        TP=  2.70    CP=0.50    NTA=  0

                              RECESSION DATA
                   STRTQ=   -1.50    QRCSN=   -0.05    RTIOR= 2.00
 UNIT HYDROGRAPH100 END-OF-PERIOD ORDINATES, LAG=   2.71 HOURS, CP= 0.50  VOL= 0.98

  2.      7.     15.     24.     34.     45.     57.     70.     83.
106.    115.    122.    128.    132.    134.    133.    129.    123.
112.    107.    102.     98.     93.     89.     85.     81.     78.
 71.     68.     65.     62.     59.     56.     54.     52.     49.
 45.     43.     41.     39.     37.     36.     34.     33.     31.
 28.     27.     26.     25.     24.     23.     22.     21.     20.
 18.     17.     16.     16.     15.     14.     14.     13.     13.
 11.     11.     10.     10.     10.      9.      9.      8.      8.
  7.      7.      7.      6.      6.      6.      5.      5.      5.
  5.      4.      4.      4.      4.      4.      3.      3.      3.
```

	0						END-OF-PERIOD FLOW					
MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
SUM		27.83	25.43	2.40		97555							
		(707.)	(646.)	(61.)		(2762.45)							

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HYDROGRAPH ROUTING

MOD PULS ROUTING OF FLOW THRU SETTLING POND

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
DAM	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.0	0.0	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.0	0.0	0.0	5.	0

CAPACITY=	0.	5.	154.	235.	631.
ELEVATION=	233.	234.	240.	242.	250.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
234.3	40.0	3.1	1.5	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
236.3	3.1	1.5	0.

CREST LENGTH AT OR BELOW ELEVATION	0.	340.	590.	1090.	1110.
	236.3	237.7	240.8	241.9	245.0

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
100.	0.25	233.00	0.25	234.00	237.00

PEAK OUTFLOW IS 187. AT TIME 43.83 HOURS
PEAK OUTFLOW IS 395. AT TIME 43.50 HOURS
PEAK OUTFLOW IS 636. AT TIME 43.00 HOURS
BEGIN DAM FAILURE AT 41.67 HOURS
PEAK OUTFLOW IS 2356. AT TIME 41.92 HOURS
BEGIN DAM FAILURE AT 41.00 HOURS
PEAK OUTFLOW IS 2374. AT TIME 41.25 HOURS
BEGIN DAM FAILURE AT 40.67 HOURS
PEAK OUTFLOW IS 2430. AT TIME 40.92 HOURS
BEGIN DAM FAILURE AT 40.17 HOURS
PEAK OUTFLOW IS 2499. AT TIME 40.42 HOURS
BEGIN DAM FAILURE AT 39.83 HOURS
PEAK OUTFLOW IS 2437. AT TIME 40.09 HOURS
BEGIN DAM FAILURE AT 39.67 HOURS
PEAK OUTFLOW IS 2466. AT TIME 39.92 HOURS

HYDROGRAPH ROUTING

MOD PULS ROUTING OF FLOW FROM DAM TO STA. 6+00

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
STA 1	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.0	0.0	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.0	0.0	0.0	0.	0

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
0.1000	0.0350	0.1000	200.0	240.0	600.	0.00330

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
0.0 240.00 200.00 210.00 390.00 202.00 394.00 200.00 404.00 200.00
408.00 202.00 490.00 210.00 780.00 240.00

STORAGE
0.0 0.41 2.08 5.82 11.63 19.49 28.65 38.80 49.95 62.10
75.25 89.39 104.53 120.67 137.80 155.93 175.06 195.19 216.31 238.43

OUTFLOW
0.0 99.12 463.75 1264.92 2658.63 4831.08 7951.64 11866.12 16592.99 22157.57
28588.78 35917.47 44175.60 53395.67 63610.34 74852.44 87154.69 100549.69 115069.69 130746.75

STAGE
200.00 202.11 204.21 206.32 208.42 210.53 212.63 214.74 216.84 218.95
221.05 223.16 225.26 227.37 229.47 231.58 233.68 235.79 237.89 240.00

FLOW
0.0 99.12 463.75 1264.92 2658.63 4831.08 7951.64 11866.12 16592.99 22157.57
28588.78 35917.47 44175.60 53395.67 63610.34 74852.44 87154.69 100549.69 115069.69 130746.75

MAXIMUM STAGE IS 202.6
MAXIMUM STAGE IS 203.8
MAXIMUM STAGE IS 204.7
MAXIMUM STAGE IS 207.5
MAXIMUM STAGE IS 207.5
MAXIMUM STAGE IS 207.6
MAXIMUM STAGE IS 207.7
MAXIMUM STAGE IS 207.6
MAXIMUM STAGE IS 207.7

HYDROGRAPH ROUTING

MOD PULS ROUTING OF FLOW FROM STA. 6+00 TO STA. 17+00

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
STA 2	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.0	0.0	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.0	0.0	0.0	0.	0

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
0.1000	0.0350	0.1000	190.0	210.0	1100.	0.00910

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
0.0 210.00 160.00 200.00 390.00 192.00 394.00 190.00 404.00 190.00
408.00 192.00 500.00 200.00 600.00 210.00

STORAGE

0.0	0.32	0.76	1.91	4.20	7.60	12.13	17.79	24.58	32.49
41.48	51.24	61.74	72.96	84.90	97.58	110.98	125.11	139.97	155.55

OUTFLOW

0.0	47.03	164.60	399.55	793.32	1392.94	2238.81	3367.68	4813.82	6609.64
8854.63	11554.44	14646.01	18140.87	22051.25	26389.84	31169.59	36403.44	42104.53	48285.95

STAGE

190.00	191.05	192.11	193.16	194.21	195.26	196.32	197.37	198.42	199.47
200.53	201.58	202.63	203.68	204.74	205.79	206.84	207.89	208.95	210.00

FLOW

0.0	47.03	164.60	399.55	793.32	1392.94	2238.81	3367.68	4813.82	6609.64
8854.63	11554.44	14646.01	18140.87	22051.25	26389.84	31169.59	36403.44	42104.53	48285.95

MAXIMUM STAGE IS 192.2
MAXIMUM STAGE IS 193.1
MAXIMUM STAGE IS 193.8
MAXIMUM STAGE IS 195.8
MAXIMUM STAGE IS 195.9
MAXIMUM STAGE IS 196.0
MAXIMUM STAGE IS 196.1
MAXIMUM STAGE IS 196.0
MAXIMUM STAGE IS 196.3

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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OP.	STA.	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6	RATIO 7	RATIO 8	RATIO 9
				0.10	0.20	0.30	0.40	0.50	0.60	0.80	0.90	1.00
HYDRO		1.08	1	222.	443.	665	887.	1108.	1330.	1773.	1995.	2216.
AT LAKE		(2.80)		(6.28)	(12.55)	(18.83)	(25.10)	(31.38)	(37.66)	(50.21)	(56.48)	(62.76)
ROUTED		1.08	1	187.	395.	636.	1973.	2008.	2066.	2135.	2079.	2192.
TO DAM		(2.80)		(5.28)	(11.18)	(18.00)	(55.88)	(56.85)	(58.49)	(60.45)	(58.87)	(62.06)
ROUTED		1.08	1	186.	395.	635.	2042.	2065.	2120.	2188.	2129.	2192.
TO STA	1(	2.80)		(5.28)	(11.18)	(17.99)	(57.81)	(58.47)	(60.05)	(61.95)	(60.30)	(62.07)
ROUTED		1.08	1	186.	395.	635.	1855.	1898.	1959.	2031.	1978.	2190.
TO STA	2(	2.80)		(5.28)	(11.18)	(17.98)	(52.54)	(53.76)	(55.47)	(57.51)	(56.01)	(62.01)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ..	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	234.00	234.30	236.30
STORAGE	5.	13.	62.
OUTFLOW	0.	0.	351.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.10	235.61	0.0	45.	187.	0.0	43.83	0.0
0.20	236.46	0.16	66.	395.	2.50	43.50	0.0
0.30	236.96	0.66	78.	636.	5.67	43.00	0.0
0.40	237.06	0.76	81.	2356.	1.44	41.92	41.67
0.50	237.02	0.72	80.	2374.	1.28	41.25	41.00
0.60	237.06	0.76	81.	2430.	1.29	40.92	40.67
0.80	237.12	0.82	82.	2499.	1.48	40.42	40.17
0.90	237.05	0.75	81.	2437.	1.30	40.09	39.83
1.00	237.09	0.79	82.	2466.	1.30	39.92	39.67

PLAN 1 STATION STA 1

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.10	186.	202.6	43.83
0.20	395.	203.8	43.50
0.30	635.	204.7	43.00
0.40	2042.	207.5	42.00
0.50	2065.	207.5	41.33
0.60	2120.	207.6	41.00
0.80	2188.	207.7	40.50
0.90	2129.	207.6	40.17
1.00	2192.	207.7	42.67

PLAN 1 STATION STA 2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.10	186.	192.2	44.00
0.20	395.	193.1	43.67
0.30	635.	193.8	43.17
0.40	1855.	195.8	42.17
0.50	1898.	195.9	41.50
0.60	1959.	196.0	41.17
0.80	2031.	196.1	40.67
0.90	1978.	196.0	40.33
1.00	2190.	196.3	42.67

PAD
6/11/81
CHKD KCS
6-24-81

AGEE JETEL & ASSOCIATES
CONSULTING ENGINEERS
ELLICOTT CITY, MARYLAND

PROJECT NO 80074

PROJECT: Contee Main Settling Pond.
Reservoir Storage Volume vs. Elevation SHEET NO. D-17 OF

1. Normal pool at elevation 234 and reservoir surface area at El. 240 and El. 250 contours were measured from USGS 7½ min. topographic map. Reservoir surface area at normal pool measured from 1" = 200' plan drawing of settling pond obtained from state records.

2. Area.

Assume average water depth = 1 ft

El. 233 Area = 0
Normal Pool El. 234 Area = 15.5 acres *
at normal pool, only about 1/3 of area is water, 2/3 is sediment
use area of water = 5.2 acres.
El. 240 Area = 34.0
250 Area = 61.5 acres.

3. Volume

El. 233 Vol = 0
234 Vol. = 5.2 AF (Avg. water depth = 1 ft.)
240 Vol = (15.5 + 34)/2 * 6 + 5.2 = 153.7 AF
250 Vol. = (34 + 61.5)/2 * 10 + 153.7 = 631.3 AF

Maximum Storage at El. 241.9

$$Vol = (631.3 - 153.7) \times 1.9/10 + 153.7 = 244.4 \text{ AF}$$

Storage at lowest point of dam crest - El. 236.3

$$Vol. = (153.7 - 5.2) \times \frac{2.3}{6} + 5.2 = 62.1 \text{ AF}$$

Emergency Spillway Crest at El. 234.3

$$Vol. = (153.7 - 5.2) \times \frac{0.3}{6} + 5.2 = 12.6 \text{ A.F.}$$

BY PAD
DATE 6/11/81
CHECKED JLM
DATE 6/24/81

ACKENHEIL & ASSOCIATES
CONSULTING ENGINEERS
BALTIMORE, MARYLAND

PROJECT NO 80074

SUBJECT: Contee Main Settling Pond
Breach Analysis

SHEET NO D-18 OF

Route flow from dam breach to damage center @ Rt. 95

Station 1 600' from toe of dam

Elev.	distance
240	0
210	200
202	390
200	394
200	404
202	408
210	450
240	780

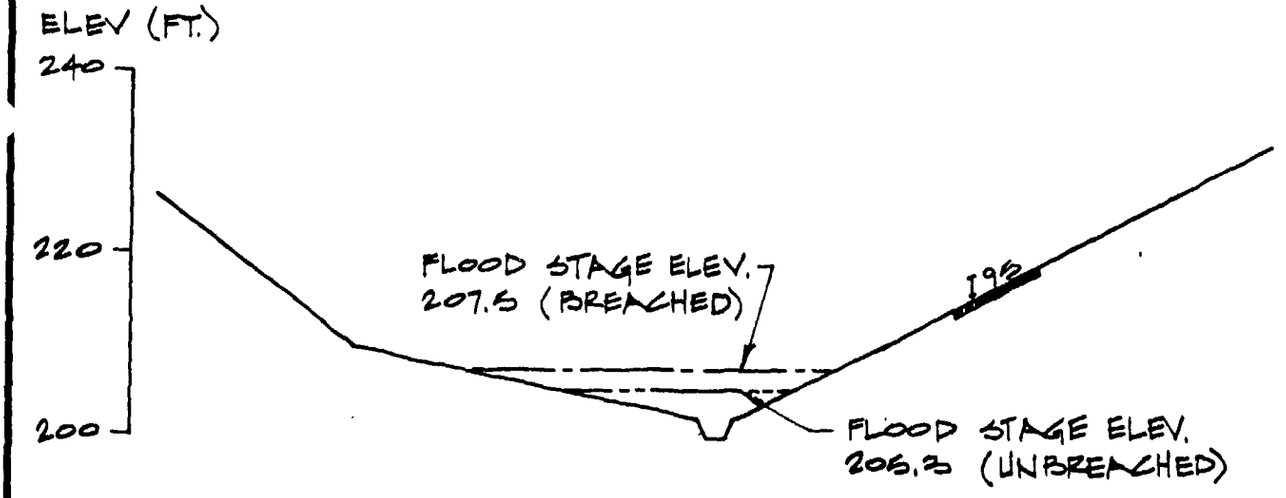
Elevation at toe of dam = 202

Gradient = $\frac{202 - 200}{600} = 0.0033$

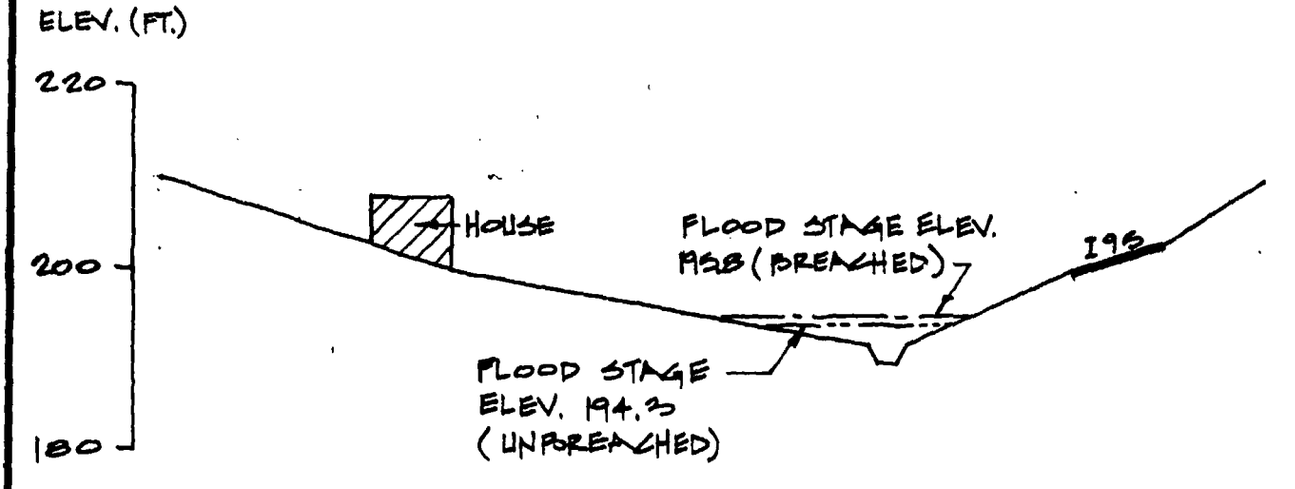
Station 2 1700' from toe of dam.

Elev.	distance
210	0
200	160
192	390
190	394
190	404
192	408
200	500
210	600

Gradient = $\frac{200 - 190}{1100} = 0.0091$



STA.1 - 600' DOWNSTREAM



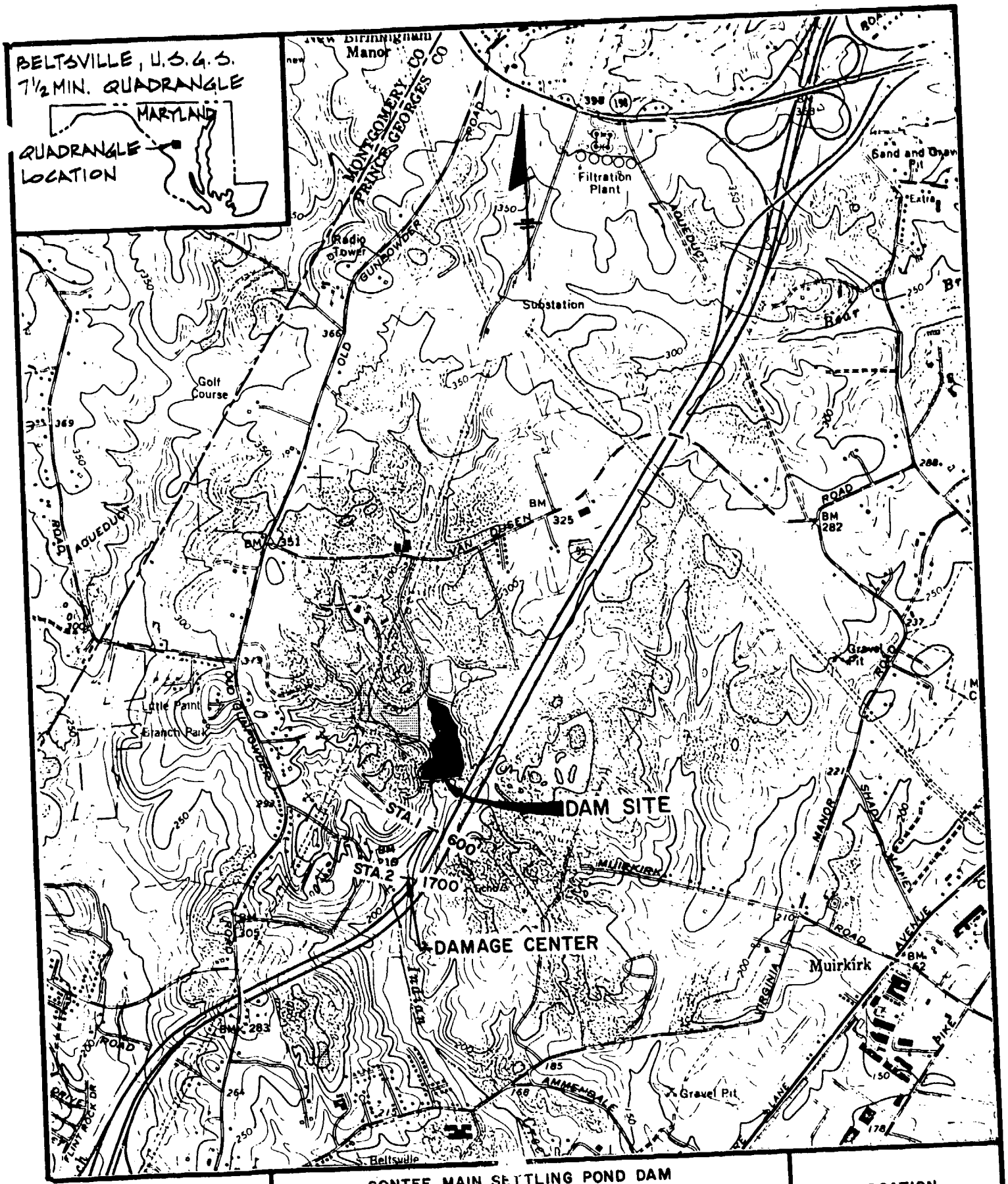
STA.2 - 1700' DOWNSTREAM

DATE: JUNE 29, 1981		CONTEE MAIN SETTLING POND DAM NATIONAL DAM INSPECTION PROGRAM	STA.1 & STA.2 CROSS-SECTIONS
SCALE: 1"=20' VERT 1"=100' HORIZ.			
DR: JLM	CK: PAD	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS GEO SYSTEMS, INC. 1000 BANKSVILLE RD./PITTSBURGH, PA. 15216	
DWG. NO. D-19			

DATAPRINT N02467

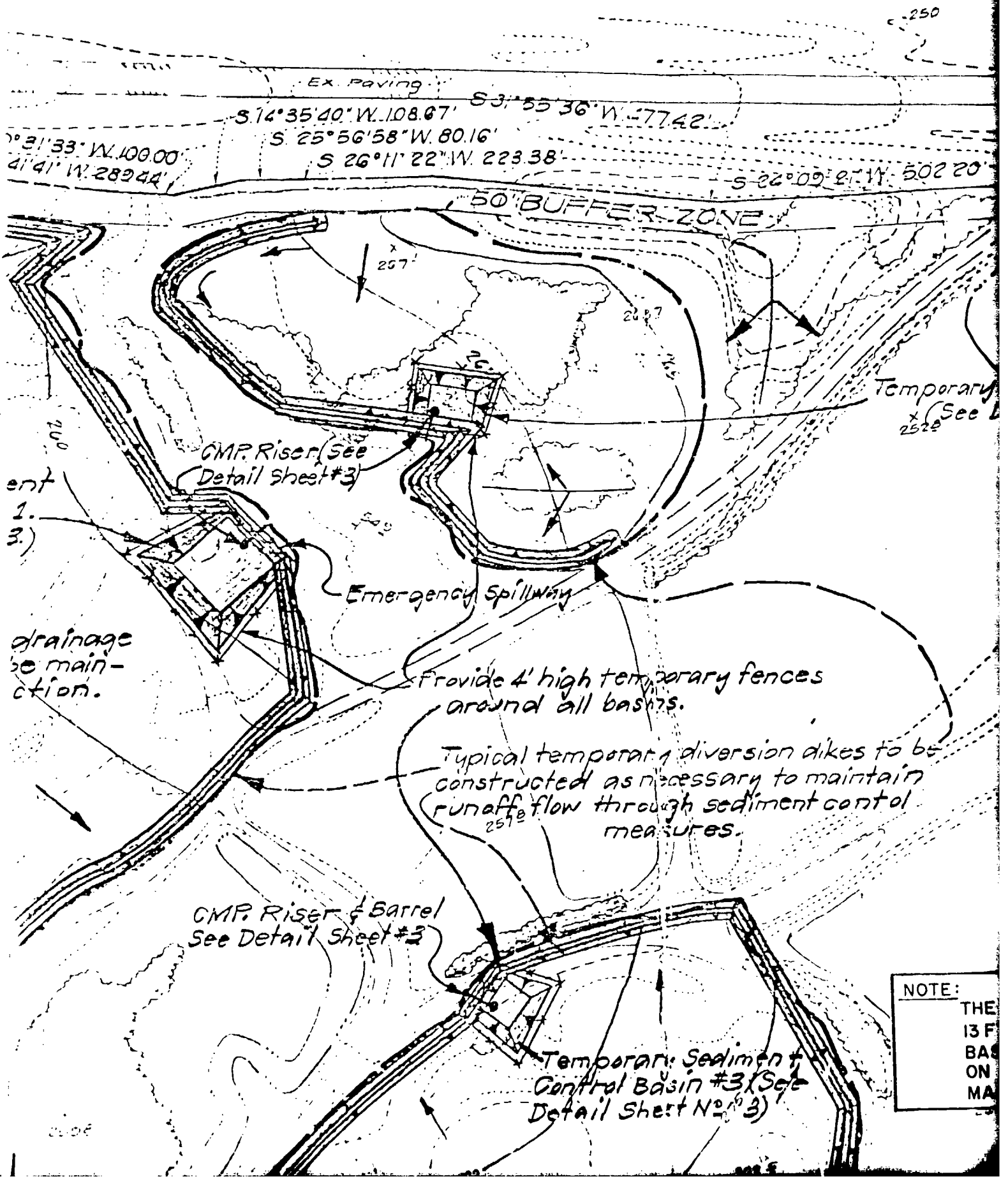
APPENDIX E

LOCATION PLAN AND PLATE

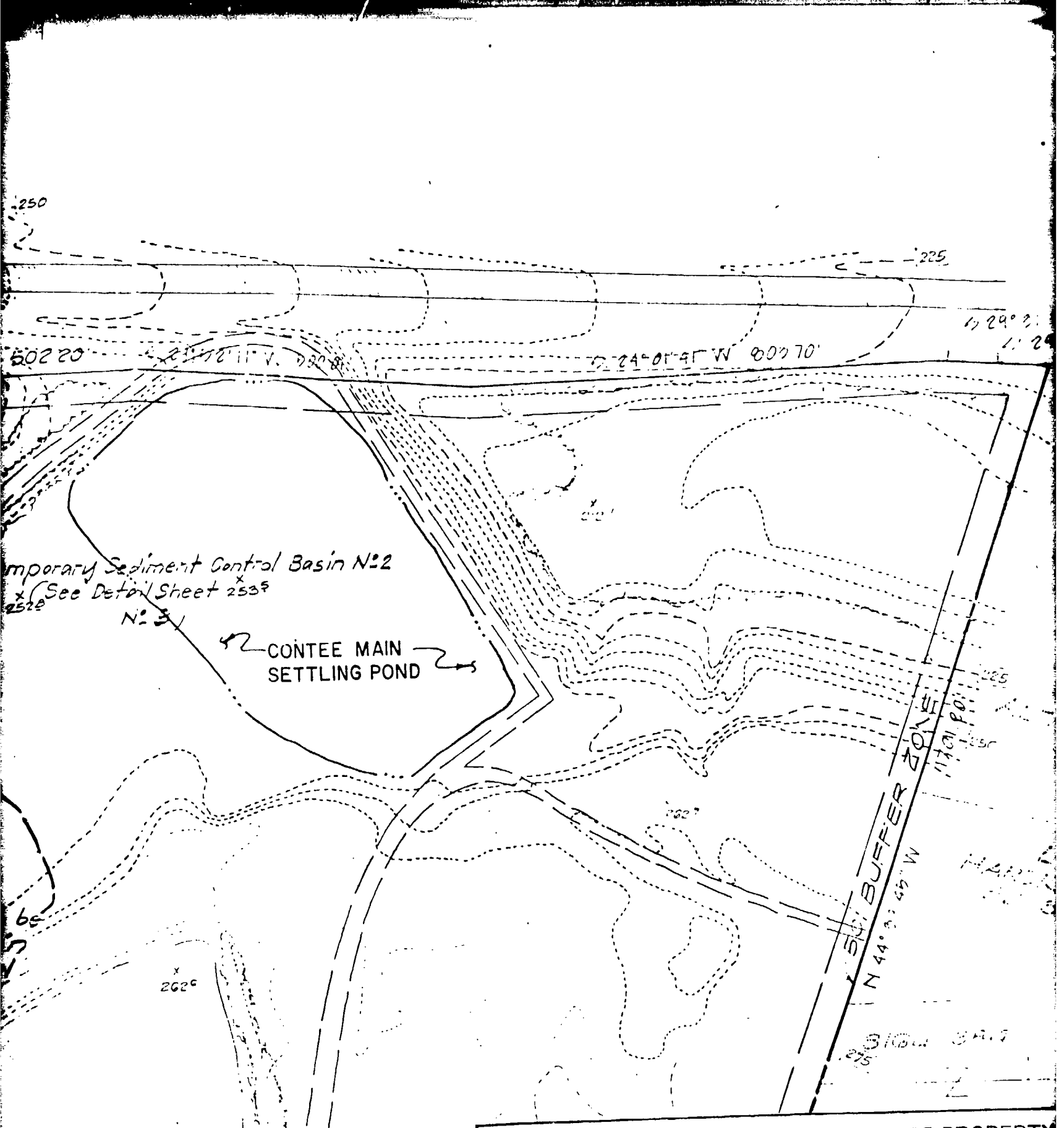


DATE: JUNE 29, 1981	CONTEE MAIN SETTLING POND DAM NATIONAL DAM INSPECTION PROGRAM	LOCATION PLAN
SCALE: 1"=2000'		
DR: JLM CK: PAD	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS GEO SYSTEMS, INC. 1000 BANKSVILLE RD./PITTSBURGH, PA 15216	
E-1		

INTERSTATE ROUTE 95



NOTE:
THE
13 F
BAS
ON
MA



NOTE:
THE ELEVATIONS SHOWN ARE ABOUT 13 FT. GREATER THAN ELEVATIONS BASED ON MEAN SEA LEVEL SHOWN ON THE USGS 7½ MIN. TOPOGRAPHIC MAP.

SEDIMENT CONTROL PLAN FOR CONTEE PROPERTY
FROM DRAWING PREPARED BY
GREENHORNE AND O'MARA INC.
DATED JULY, 1974
SCALE: 1"= 200'

DWG. NO. E-2

PLATE NO. 1

APPENDIX F

REGIONAL GEOLOGY

CONTEE MAIN SETTLING POND DAM
NDI ID. NO. MD 00081
REGIONAL GEOLOGY

REGIONAL GEOLOGY

The Contee Main Settling Pond Dam is located in Prince Georges County, Maryland, within the Coastal Plain Physiographic Province. The dam is located approximately 4 miles southwest of Laurel and is adjacent to the southbound lanes of Interstate Highway 95 on Indian Creek. The site is underlain by the Patuxent Formation. This formation consists of large round pebbles, fine white, pink, or yellow sand and thin lenses of white or iron-stained kaolinite clay.

SITE GEOLOGY

No subsurface investigation was performed at the dam site. The soils at the site are predominately sand and gravel. Bedrock is at an approximate depth of 100 feet.

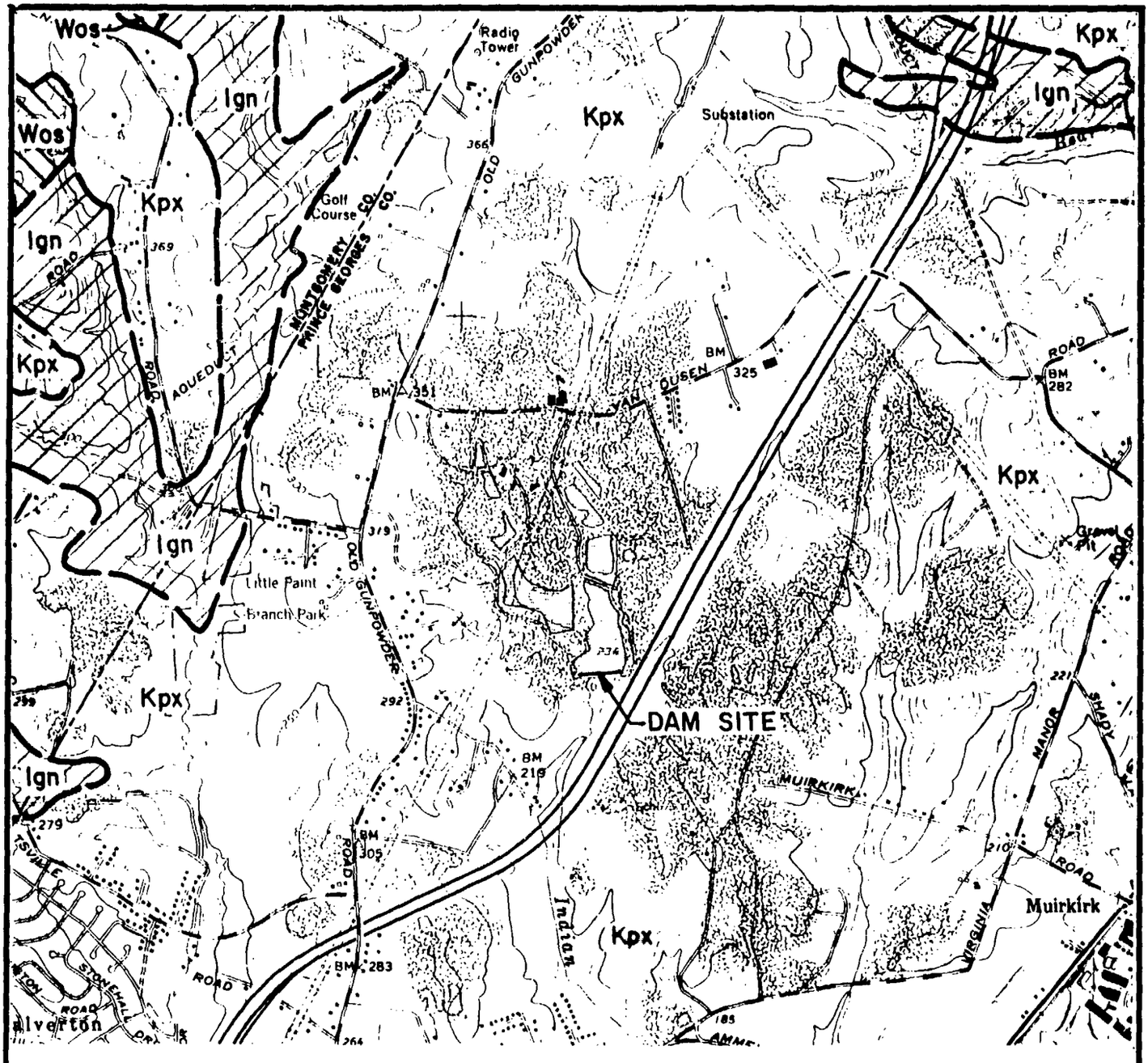
LEGEND

Kpx - Patuxent Formation
lgn - Laurel Gneiss
Wos - Wissahickon Formation

References

1. Geologic Map of Prince Georges County, Department of Geology, Mines and Water Resources, State of Maryland, 1951.

2. Geologic Map of Maryland, Maryland Geologic Survey, 1933.



BELTSVILLE QUADRANGLE, PRINCE GEORGES COUNTY, MARYLAND

SCALE: 0 ½ MILE 1:24000

CONTOUR INTERVAL 10 FT. DATUM IS MEAN SEA LEVEL

FORMATION CONTACT

DATA OBTAINED FROM UNITED STATES GEOLOGICAL SURVEY'S, GEOLOGIC MAP OF PRINCE GEORGES COUNTY, MD., 1951 & MONTGOMERY COUNTY, MD., 1953

DATE: JUNE 29, 1981	CONTEE MAIN SETTLING POND DAM	GEOLOGIC MAP
SCALE: 1"=2000'	NATIONAL DAM INSPECTION PROGRAM	
DR: JLM CK: PAD	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS	
DWG. NO. F-2	GEO SYSTEMS, INC. 1000 BANKSVILLE RD/PITTSBURGH PA 15216	

DATAPRINT N02467